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## **Measures for potable water quality maintenance in large plumbing installations during COVID 19 and other reduced usage events**

The COVID 19 pandemic has had a major influence on our lives for the past several months. The “stay-at-home” protocols have placed limits on travel, the economy and our daily professional and private regimes. The reduced occupation of buildings including hotels, schools, universities, and office buildings has limited the usage of building plumbing systems. Measures are now required in order to maintain a sufficient water exchange in the entire plumbing installation to minimize the risk of stagnation and health risks for returning occupants.

In time, the temperature of stagnant water in building pipework will adapt to a building’s environmental/ambient air temperature. During periods of non-use, it is common for the temperature of cold-water to increase, and the temperature of hot water to decrease. In many instances, the resulting temperatures can fall into the range that is conducive for the growth of water-borne bacteria such as Legionella. The growth temperature of Legionella is commonly reported to be between 77°F and 113°F (25°C and 45°C) with the optimum growth range between 85°F and 108°F (30°C and 42°C).

The inhalation of atomized water contaminated with Legionella bacteria can lead to a fatal pneumonia or to Pontiac-fever with similar symptoms to a SARS-CoV-2 infection. Atomization of water can be caused by flushing a toilet, using a shower or opening a tap to wash your hands. It can be expected that a Legionella infection, which leads to death in one of ten cases, will exacerbate a parallel or subsequent SARS-CoV-2 infection as it attacks and damages the lungs.

It is important to maintain high quality water in plumbing installations during the COVID 19 restrictions. Two different scenarios are possible:

### **1. Maintain normal usage and control regime**

If the building will be closed for less than a month or it will have a lower occupancy, the intended use and normal control regime shall be maintained. The lack of water consumption must be compensated by flushing every hot and cold-water outlet at least weekly. Simultaneous flushing of outlets of zones (e.g. floor, ward) shall be done to achieve a sufficient flow rate in all pipes. Flush the outlets until cold water reaches a temperature of 77°F (25°C) or below, and hot water reaches its maximum temperature. A control regime shall be implemented to ensure sufficient disinfectant residual.

Plumbing installations that incorporate the Kemper Flow-Splitter minimize the effort and cost of manual flushing as a typical Flow-Splitter installation reduces the use of single-feed pipes. Flushing of the main distribution pipe causes a water exchange in preceding pipework. The reduction of single feed pipes in favour of Flow-Splitter loops results in time savings and water savings during the flushing process.

## 2. Shut down of plumbing installation

If the building will be unoccupied for more than a month or the hot water turned off to save energy, the installation should remain filled with water. A drained installation may promote bacteria growth due to water pockets and condensation. Therefore, we only consider measures for a shut down but not drained installation.

Shutting down the plumbing installation means that the hot water heating system will be turned off. Flush the entire hot water system at all outlets until a cold-water temperature of 77°F (25°C) or below is achieved at every outlet and the hot water tank is also maintained at this temperature level. Keep the hot water circulation pump running as there would be a risk of stagnation in hot water return pipes otherwise. Perform a flushing process at least weekly similar to the flushing process described above, with the difference that only cold water is flushed at hot and cold outlets. Thermostatic mixing valves shall be set to the temperature maximum for flushing. A sufficient disinfectant residual shall be ensured too. The flushed water can be used for other purpose, such as irrigation.

The re-commissioning of the plumbing installation shall take place just before normal operation. To re-commission the installation flush the hot and cold-water installation first. Flushing shall be done zone by zone, starting with the zone nearest to the origin of the water. Flushing of a zone shall start with the first outlet nearest to the beginning of the zone and all outlets till the end of the zone shall be opened subsequently. The outlets shall be closed when the temperature of the water reaches 77°F (25°C) or below consistently, but for no less than five minutes. Closing the outlets shall start with the last outlet of the zone. The hot water heating system can be started after completing the flushing process. The entire hot water supply and return installation must be heated to normal operating temperature and the hot water outlets shall be flushed until the maximum temperature is reached.

### Resources:

1. American Society for Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE® ). 2000. Guideline 12-200, Minimizing the risk of legionellosis associated with building water systems.
2. [https://www.esamid.org/research\\_projects/study\\_groups/legionella\\_infections/](https://www.esamid.org/research_projects/study_groups/legionella_infections/)
3. [https://www.health.pa.gov/topics/Documents/HAN/2020-PAHAN-507-05-11-ALT-Restarting.pdf?\\_ga=2.2865079.681169174.1591707930-1763898213.1591707930](https://www.health.pa.gov/topics/Documents/HAN/2020-PAHAN-507-05-11-ALT-Restarting.pdf?_ga=2.2865079.681169174.1591707930-1763898213.1591707930)
4. Proctor CR, Rhoads WJ, Keane T, Salehi M, Hamilton K, Pieper KJ, Cwierty DM, Prévost M, Whelton AJ. Considerations for Large Building Water Quality after Extended Stagnation. Preprint downloaded April 7, 2020. Available for download at DOI: <https://doi.org/10.31219/osf.io/qvj3b>.
5. <https://engineering.purdue.edu/PlumbingSafety/covid19/building-water-safety-study>
6. [https://www.fh-muenster.de/egu/downloads/personen/baecker/Merkblatt\\_zur\\_Sicherstellung\\_der\\_hygienischen\\_Qualitaet\\_von\\_Trinkwasser\\_in\\_Gebaeuden.pdf](https://www.fh-muenster.de/egu/downloads/personen/baecker/Merkblatt_zur_Sicherstellung_der_hygienischen_Qualitaet_von_Trinkwasser_in_Gebaeuden.pdf)
7. <https://www.nytimes.com/2020/05/20/health/coronavirus-legionnaires-offices.html>

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