HACCP Plan for
Prevention of Legionellosis Associated with Building Water Systems

ASHRAE has proposed a new standard (ASHRAE 188P: *Prevention of Legionellosis Associated with Building Water Systems*) to strengthen guidance on recommended actions to prevent disease caused by *Legionella* in building water systems. *Legionella* infections are caused by exposure to contaminated aerosolized or aspirated water. The goal of ASHRAE 188P is to specify a standard practice to prevent the spread of legionellosis associated with building water systems. The principle behind the standard is based on a type of risk management system used in many industries, including the food industry, called the hazard analysis and critical control point (HACCP) method.

In applying the HACCP approach to building water systems, three types of hazards—biological, chemical, and physical—must be analyzed at each point in a building where water is processed. In a hospital, these locations include points where the water enters the building, the heating system, and distribution piping.

Hospitals often have a subsystem for processing water for drinking fountains that filters the water, cools it, and filters it again, and other subsystems might handle water used for fire suppression and ice machines, steam tables, and cafeteria service lines. Water in each of these subsystems should be processed in the same way as water for drinking fountains (see the accompanying table).

Types of Hospital Water Usage

Type	Potable	Micro standards	Exposure to potential Infection	*Legionella* issue
Drinking	YES	YES	Aerosol ingestion	YES
Laboratory	NO	YES	False positive	NO
Dialysis	NO	YES	Endotoxin reaction/infection	NO
Process/heating-cooling	NO	YES	Heat transfer	YES
Fire suppression	NO	NO	Inefficiency	NO

The first step in the actions recommended in ASHRAE 188P is for a water management team appointed by the hospital to draw two process flow diagrams of the facility's water distribution system—one for the potable water system and one for the utility water system. These should be schematic process flow diagrams, not complex engineering drawings.

The process flow diagrams are used to identify the facility's control points—those locations in the building water system where measures could be taken to *eliminate, reduce,* or *prevent* a *Legionella* hazard. A critical control point (CCP) is any location where hazard control must be applied to prevent or eliminate a hazard. In hospitals, the junctures where water enters higher risk patient units (e.g., transplant units, oncology units, surgical intensive care units, etc.) are such critical points.

The proposed HACCP approach described in ASHRAE 188P is reprinted below, with commentary added:

1. An HACCP team, including at least one person who understands the principles of HACCP and at least one person who understands the building water systems, shall be formed by the building owner and/or owner's building management team. Members of the HACCP team shall consist of employees, suppliers, consultants, or any combination thereof. The HACCP team shall be responsible for the remaining actions in this section.

2. Identify the end-point uses of potable and utility (non-potable) water systems within the building.

3. Develop at least two process flow diagrams (one each for the potable water and utility water systems) that illustrate how the water is received, processed and delivered to end-point uses within the building.

The accompanying figure shows typical diagrams of hospital water supply uses. The purpose of these simple diagrams is to locate points where the water supply could reach patients susceptible to *Legionella*, such as any specialty patient care units. Each processing step must be named and numbered on each process flow diagram. Process flow diagrams are to be used to systematically analyze hazards at each identified step in the water distribution process (see Step 5).

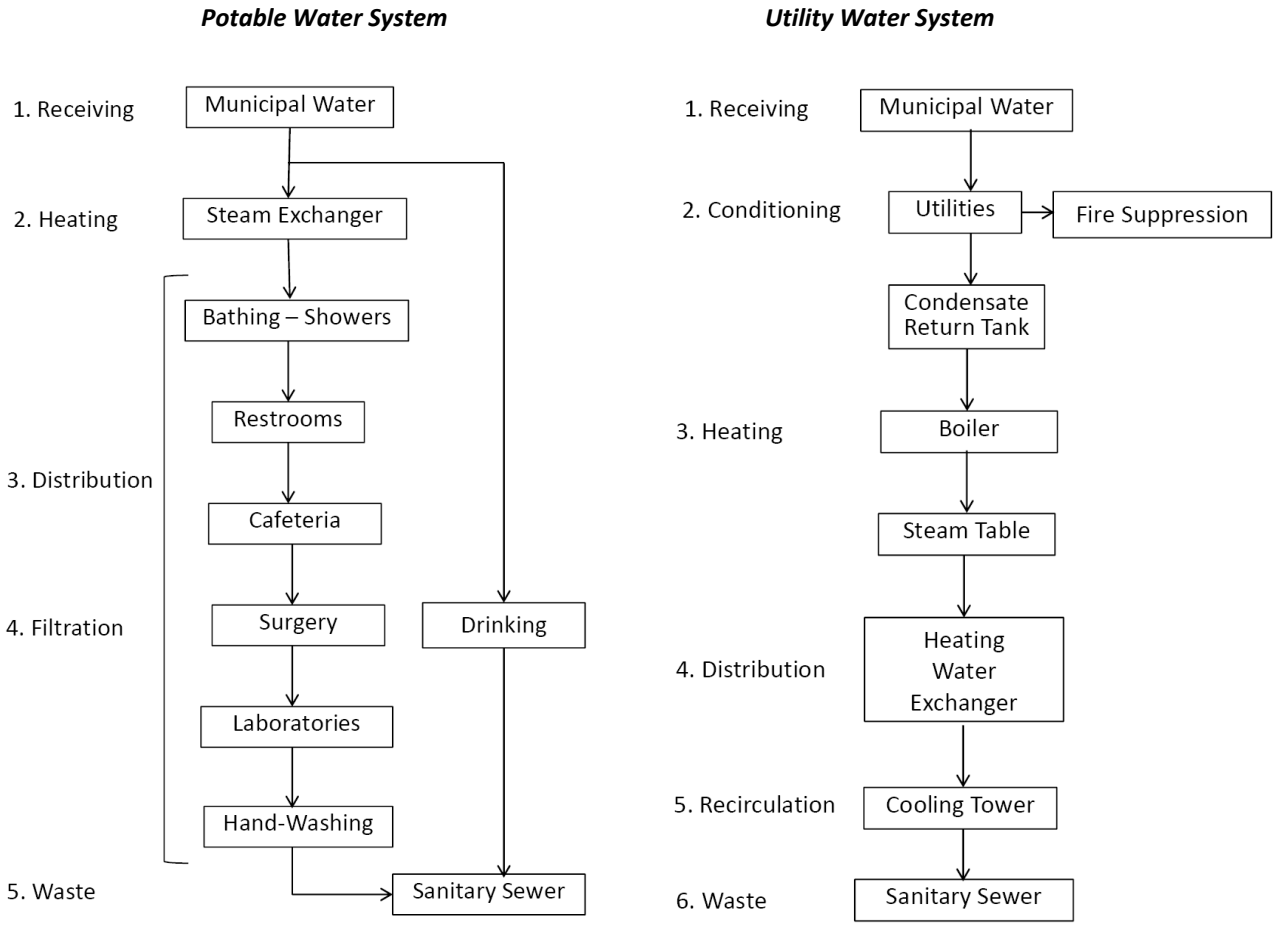
4. Confirm that the process flow diagrams are accurate by an on-site inspection.

5. Use the process flow diagrams and hazard analysis summaries to identify control points (CPs) in the process.

The purpose of hazard analysis is to characterize the risk at each step in the process and decide if hazard control is necessary at that processing point. Each critical control point (CCP) is then described and identified on the process flow diagram.

6. Decide which control points are critical control points (CCPs), and indicate them on the process flow diagrams.

Sample Simplified Process Flow Diagrams for Hospital Water Service



7. Establish critical control limits for each CCP.

For example, if the hazard control method at a critical control point is chlorine, the critical limit is the range of chlorine residual applied. A number of suitable water treatments have been recommended for use when *Legionella* has been identified as the cause of legionellosis or has been strongly associated with the facility. One such treatment is superheating the water to at least 149^0F; another is "shock" hyper-chlorination (>10mg/L of chlorine in the water).

8. Establish a monitoring procedure for each critical limit at each CCP and the monitoring frequency.

Monitoring refers to measurements of the critical limits in a water system (e.g., chlorine residual measurements or temperature measurements). Monitoring should never refer to *Legionella* testing. The CDC does not recommend routine culture of water systems for *Legionella* except in certain high-risk environments.

9. For each critical limit, establish corrective actions to take when deviations from critical limits are found.

These actions must be implemented if the hazard control (e.g., heat or chemical disinfection) is out of specifications. Remember that corrective actions are not what is to be done in response to a positive *Legionella* test result or a clinical case of legionellosis. Rather, corrective actions are what is to be done if a critical limit is violated (e.g., if the chlorine concentration is out of specification).

10. Validate the selection of CCPs, critical limits, and corrective actions.

Validation is evidence that hazards have been controlled under operating conditions (disease surveillance provides acceptable evidence that hazards are under control). If validation indicates that hazards have not been controlled in the building water system, the water management team must reassess the HACCP plan and decide what further hazard control is necessary.

The CDC does not recommend routine culture of water systems for *Legionella* except in certain high-risk environments.

11. Establish verification procedures.

Verification is confirmation that the plan has been implemented. It must include critical limit monitoring data, corrective action logs, and records documenting meetings of the water management team.

12. Establish documentation and record-keeping procedures as required in Section 7.3 of ASHRAE 188P.

Questions? Contact John Collins, FASHE, HFDP, ASHE Engineering & Compliance Director, at jcollins@aha.org or 312-422-3805.