

# Water commissioning: Keeping the flow smooth

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**W**ater systems are the lifeblood of health care facilities. Power outages get a lot of attention, but a disruption in water service can cause just as much trouble. Commissioning your water system after construction is complete, or re-commissioning at some point after the facility is occupied, is an essential step toward reliability.

As with commissioning other elements of your hospital, commissioning your water system is a multi-step process. It begins with a plan, which leads to an investigation. After the investigation, improvements are made, and the system is formally handed off to the operations and maintenance team. To make sure the improvements last, an on-going commissioning process may also be developed.

## Making the plan

To examine your facility's water system, a team of responsible, knowledgeable personnel need to be assembled and dedicated to water safety. This team should include members from administration, facilities, infection prevention control, and other departments such as nursing as needed. The purpose of this team is to develop, implement, and manage an appropriate risk management program for the water system(s).

A good place to start a program is with a detailed diagram of how water flows through a facility. This diagram provides facility personnel with an overview of the system and identifies the system's intended operational goals.

Start with your original construction documents. Many will already include a flow diagram of the system, or at least the main components. These documents



likely will not include areas that were added subsequent to construction, nor any new or replacement equipment.

Identify the source of water and service entrances. Create a comprehensive system diagram that indicates all equipment and maintenance shut-off valves; this will be important to the long-term operation of the system. This comprehensive diagram helps the commissioning agent and a facility operator identify potential areas of concern and inspection and testing locations for water quality testing.

Once they understand what the water system should be doing, the commissioning team can develop an inspection plan. This involves examining every element, from intake to reservoirs to discharge. Proper commissioning will reveal vulnerabilities in the mechanical elements of the water system, and may reveal leaks and other inefficiencies. The most important issue that may be revealed by commissioning is the risk of pathogen growth.

The mechanical elements section lists some of the areas that need to be examined during commissioning. This is not a comprehensive list, but it gives you an idea of what the inspection entails.

### Pathogen growth

A consultant we know received a call from a newly built major academic cancer center that reported a case of Legionellosis. Investigation revealed that the facility had been built with plastic pipe, had major dead ends, and had stored

the pipe outside before installing it. Also, the pipe had been filled almost one year before occupancy of the building, which meant water stood dormant in those pipes for nearly a year. The facility did not commission the plumbing systems, so the appearance of *Legionella* within weeks of occupancy was no surprise.

On the other hand, we interviewed a colleague who holds a leadership role within a facility group at a large health system that very carefully monitors its water safety. The facility samples water every quarter from random faucets, shower heads, cooling towers, and other places where water-borne pathogens could grow. Nevertheless, occasionally something potentially dangerous, such as a strain of the bacteria that causes Legionnaire's, shows up in minuscule quantities. Pathogens can find a home even in presumably well-maintained systems.

So what should you consider during commissioning regarding pathogen growth? Keep in mind that many pathogens prefer to grow in still water, so look for and control spots where water pools and is not regularly circulated. Some possible examples include storage tanks, dead ends of pipes, and cooling towers.

Another area of concern is medical equipment that uses water or has a potential for generating condensation. This equipment should be routinely inspected to make sure it is properly cleaned, drained, and stored per the manufacturers' recommendations.

### Mechanical elements

The mechanical elements of a hospital's water system are complex. The commissioning inspection will evaluate the entire system, but some focus points will include the following:

- **Inflow:** The water entering the hospital needs to be clean and secure. Among the issues to consider about inflow is how it is being disinfected before it enters the hospital and whether the disinfection system is operating properly.

Another issue to consider when examining the water inflow is backflow prevention. Backflow is dangerous, because it could allow pathogens from the facility to enter the community's general water system. Thus, codes require a backflow prevention system. Additionally, and just as important, routine inspections and annual testing should be conducted to ensure the backflow system remains functional.

- **Water piping systems:** Among the many elements in the piping system that need to be examined during commissioning are the hand-held showerheads and faucets, aerators, and hot water tanks.
- **Cooling towers:** Cooling towers in hospitals require regular attention. Issues to consider during commissioning include shutdown, start-up, and standby modes of operation; water treatment; and maintenance procedures.
- **Whirlpools/spas:** Whirlpools and spas cause water to aerosolize, which increases the transmission of some pathogens. Similar to cooling towers, issues to consider during commissioning include shutdown, start-up, and standby modes of operation; water treatment; and maintenance procedures.



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- **Water treatment/filtration systems:** Water treatment and filtration are common in hospitals, as these ensure that the water is clean. The operations personnel must have a complete understanding of the system to ensure effectiveness. Issues to consider during commissioning include modes of operation, chemical treatment monitoring, and maintenance procedures.
- **Water heating/cooling:** Properly position water heating or cooling in relation to the water treatment system because some heating or cooling applications may have a negative effect on water treatment.

### Efficiency issues

An important role of water commissioning is ensuring that the system is running efficiently. Hospitals use a lot of water, so conserving should be a priority.

Checking for leaks in the system is one obvious aspect of this task, but in addition, ensure that all valves are closing properly.

Another conservation issue involves credit for water that does not flow into the sewer. Health care facilities are typically charged by water utilities for the amount of water that goes in and the amount that enters the sewer after being used. The water entering the sewer is not metered: the utility assumes as much water is going out as went in. Many times this is not the case, such as when water is used for landscaping or to make up water that has evaporated in a cooling tower. The commissioning examination should verify that meters exist to measure this water so the facility can report it to the water utility for a credit.

### Plan for failure

The commissioning process should also ensure that the facility has a plan in place to deal with a failure. For example, if a water main breaks, is there an alternate way for water to enter the facility? Some facilities can get their incoming water from different water mains, allowing for isolation when a break occurs. In other cases, a facility makes an agreement with a local company to supply water from a tanker truck through an external connection to the system.

Similarly, a plan should be in place to deal with internal failures of the water system, such as a critical pump breaking down or a major leak occurring. What steps are identified within the management plan to deal with these potential problems?

### After the inspection

The water commissioning process is considered a singular event, but it should lead to a chain of other events. For example, an improvement plan should

be created based on the inspection. This plan should be developed by the commissioning team in conjunction with the water management team, and it should be part of the documents for the system.

A final important step in the post-commissioning process is the establishment of, or confirmation of, on-going procedures to maintain the water system. This helps maintain the improvements made after commissioning and keeps the system healthy for the long term. ■

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