ASPR TRACIE Technical Assistance Request

Hospital Water Storage Tanks (Redacted Response)

Request Receipt Date (by ASPR TRACIE): 27 February 2018
Response Date: 9 March 2018; updated 12 March 2018; 16 June 2021; 30 April 2025
Type of TA Request: Standard

Request:

The requestor asked if ASPR TRACIE had resources related to the flow of water storage tanks at healthcare facilities/hospitals. Specifically, the following questions were asked:

- Who constructs water storage tanks?
- What sizes are available?
- What kinds of tanks are being used in healthcare facilities?

The ASPR TRACIE Team spoke with the requestor to obtain clarification on their specific needs, and the following additional information was provided:

- The hospitals that they are referring to have between 25 and 500 beds.
- They are looking for options for backup water storage tanks that would be permanently fixed at the hospitals.
    - They noted they have tried water buffalos in the past, but the hospitals did not have the necessary equipment. Therefore, they would like options for large capacity storage tanks that would be on-site, and either above or below ground.
- They noted that they visited the Florida Keys after a hurricane and that the hospitals had something similar to what they may be looking for. They also said they were willing to consider using a water bladder, as long as it has a large enough capacity and could easily be hooked up to the hospitals.

Response:

The ASPR TRACIE Team conducted on online search for resources related to water storage tanks. We also reached out to ASPR TRACIE Subject Matter Expert (SME) Cadre members to gather additional resources and anecdotal information to share with the requestor. Section I in this document provides comments from our SMEs, and Section II includes links to the resources collected.

The ASPR TRACIE Team would also like to highlight our Utility Failures Topic Collection and the Hospital Supplemental Bulk Water Supply Methods TA response document, which provides links to resources on supplemental bulk water supply methods for hospitals in the event that their primary water supply is disrupted.

I. ASPR TRACIE SME Cadre Member Comments

Note: These are direct quotes or paraphrased from emails and other correspondence provided by ASPR TRACIE SME Cadre members in response to this specific request. They do not necessarily express the views of ASPR or ASPR TRACIE. Feedback from SMEs were originally received in March 2018 and therefore may be outdated. They will remain in this document for historical purposes.

SME Cadre Member 1:

- We recommend that the requestor determine the amount of potable and non-potable water that will be needed by the facility to support emergency operations for a specific period of time (e.g., 96 hours). Increasingly, accrediting organizations (e.g., The Joint Commission) require that water is included as part of an Emergency Management Inventory.

  > The current best practice is to quantify the amount of water by the projected consumption rate (e.g., potable water to support 90% census and staff for 4 days) rather than by unit of measure (e.g., 3 pallets of 1L water bottles).

- We recommend that the requestor conduct a thorough risk analysis, particularly of non-potable water disruption; organizations are often surprised to learn of all of the functions requiring water. For example, one academic medical center, as part of its emergency management planning, had identified a number of functions requiring non-potable water (e.g., cleaning, fire suppression, and water chillers) but unexpectedly learned during an actual water outage that its medical air compressors were also water cooled – and would be unusable in the event of a water outage. The potential impact of losing its medical air compressors was significant; the neonates in the hospital's Level III NICU all required medical air (pure oxygen was not an acceptable alternative because it can cause blindness in neonates) and because of the water outage, the hospital was at significant risk of needing to evacuate its entire NICU.
- We recommend that water storage for emergency incidents be just one part of an escalating, overall water outage contingency plan. Specifically, for non-potable water, we recommend emergency water storage tanks to meet initial needs, tanker/quick connects for sustained operations, and a plan/process to shift water from lower priority functions to higher priority functions, if needed.
    - [Our state] invested heavily into non-potable storage tanks for hospitals. It may be good to touch base with [State Department of Health] about who they used for the purchase of the tanks. Contact the ASPR TRACIE Assistance Center if you wish to be connected to a point of contact for that state.
- Regarding tanker/quick connects, we note that: 1) such connections must be plumbed according to local regulations, including backflow preventers, etc.; 2) consideration of pump size/capability is important in order to overcome the head-pressure associated high-rise buildings; and 3) water quality should be continually monitored against bacteria and other contaminants that may be introduced to the system.

SME Cadre Member 2:

- This is a difficult question. Some local jurisdictions have requirements for new healthcare facilities (hospitals) for water storage tanks to be housed on top of the facility (roof). However, for the most part that is minimal. These systems are very expensive for a hospital to acquire and install ($100K or more).
- In 2018, the Joint Commission Emergency Management Chapter addressed the need for water as:
    - **EM.02.02.09 EP 3**. As part of its Emergency Operations Plan, the hospital identifies alternative means of providing the following: Water needed for consumption and essential care activities.
    - **EM.02.02.09 EP 4**. As part of its Emergency Operations Plan, the hospital identifies alternative means of providing the following: Water needed for equipment and sanitary purposes.
    - **NOTE**: The chapter originally cited by this SME has since been rewritten. In 2022, the Joint Commission released the R[3] Report: Requirement, Rationale, Reference to address new and reviewed Emergency Management standards. Review Standard EM.12.02.09 and Standard EM.14.01.01
- Due to the cost associated and the two Elements of Performance mentioned previously, many hospitals do what we do, and that is store both potable and non-potable water. We use bottled water, which we have stored both at the local hospitals and at our central supply warehouse for all of our hospitals. When the water bottles reach their expiration date, we keep them in stock as non-potable to assist with flushing commodes, etc. We also have an agreement with a main vendor to provide water during emergencies.
- For hospitals that are larger in size, underground systems would be costlier. I think the prudent thing is to state is that there will be financial investments the hospitals will have to make if they decide to install them.

SME Cadre Member 3:

- This is a great question! Disruption can occur to a hospital or healthcare facility due to natural occurrences or intentional acts. It is one of the reasons hospitals and healthcare facilities are asked to calculate an "on hand" supply of bottled water (jugs and bottles) for patients, staff and visitors/day x 72-96 hours.
- My hospital has experienced several water emergencies (e.g., disgruntled employee intentionally contaminated the public water supply with E.coli). Other hospitals within my local healthcare coalition underwent water main disruption from hurricanes after fallen trees uprooted the pipes. The primary services that were disrupted were operating rooms and dialysis.
- Also, water pressure can decrease as a result of disasters. We learned that booster pumps can mitigate this issue.
- I would suggest that the requestor work with their facility engineers (they know about using chiller storage water for a reserve supply and they have a working relationship with their municipal water management), their local water department (who are trained

to manage water emergencies), their local EMS agencies, and their local dialysis community partner.

- I spoke with someone from a dialysis coalition who has direct contact with vendors in the case of a loss or disruption of water supply. He requests a portable tanker truck to come, which he says will last him a week. The tanker company he uses also supplies water for the orange groves in non-emergency times.
    - He said he recently participated in a nuclear power plant exercise and thought through water disruption/contamination. The deep well water sources would still be safe to use for potable water as they are typically 100 feet underground. So, as long as the tanker trucks were operational, the water would be safe to use.
    - During Hurricane Charley, he went through the County Emergency Operations Center to support dialysis services and they helped to get the tanker truck from another source (his primary source is in the [City] area which got hit), but otherwise he contacts his vendor directly.

SME Cadre Member 4:

- There is a big difference between potable and non-potable water storage tanks.
- Among the potable options in an emergency is to work with any dairy farmers in their area because they usually haul fresh milk in aluminum or stainless steel trucks with 5,000 gallons or more capacity. They can be filled with potable water and directly connected to a building if it has been plumbed in advance with the appropriate connection.
- Our hospitals do not depend on farmers, but we do have a commercial company that will supply us with trailers to haul water.
- Another option is to work with their local fire departments, who may have tankers for off-road water supply that can provide non-potable bulk water supply.
- I also suggest the requestor speak with fire truck manufacturers in their state (if there are any) because all fire trucks carrying water have aluminum or stainless steel tanks on them and hospitals may be able to buy the tanks directly from them.
- Several companies sell water tanks, but they tend to be only the 500-gallon capacity or so in my queries.

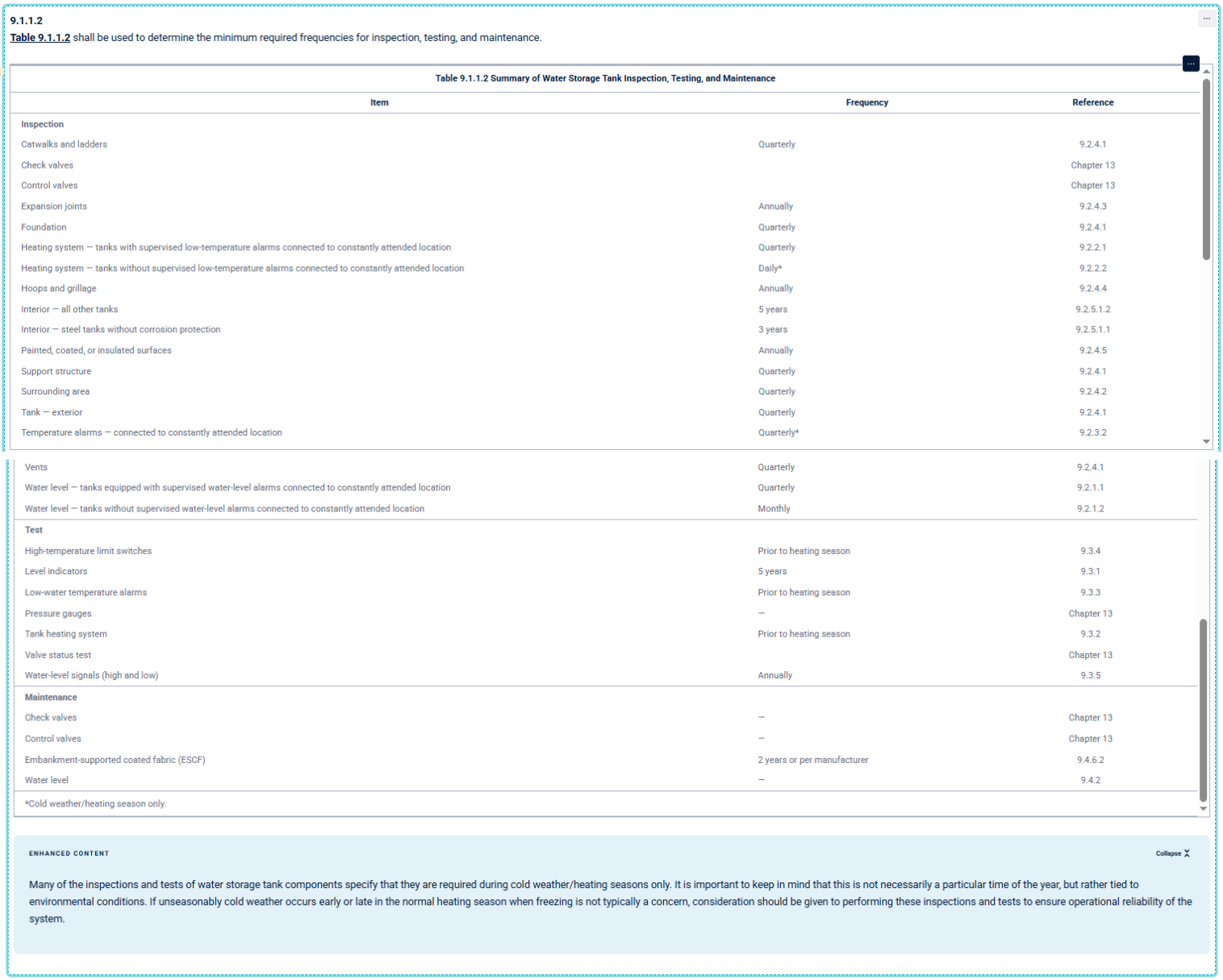
II. Healthcare Facility Water Storage Tank Resources

Centers for Disease Control and Prevention and American Water Works Association. (2019). Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities.

This comprehensive document provides a four-step process for the development of a hospital emergency water supply plan and includes tips for assembling the right planning team, performing a water use audit, analyzing alternatives, and developing and exercising the plan. It is also available in Spanish: https://www.cdc.gov/water-emergency/media/pdfs/19_302124-EWSP-GUIDE-SPANISH.pdf. **Note**: Chapter 7 addresses water storage tanks and will be particularly useful.

National Fire Protection Agency (NFPA). (2023). Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. (**NOTE**: Free registration required to access document.)

This NFPA document was referenced by an ASPR TRACIE SME Cadre member. It provides information on the minimum requirements for the periodic inspection, testing, and maintenance of water-based fire protection systems. **NOTE**: Chapter 9 addresses water storage tanks. Refer to ***NFPA 25-2023; Table 9.1.1.2*** for additional guidance on performing tests on water storage. The following is a screenshot of this table.



9.1.1.2

Table 9.1.1.2 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

Table 9.1.1.2 Summary of Water Storage Tank Inspection, Testing, and Maintenance

Item	Frequency	Reference
Inspection		
Catwalks and ladders	Quarterly	9.2.4.1
Check valves		Chapter 13
Control valves		Chapter 13
Expansion joints	Annually	9.2.4.3
Foundation	Quarterly	9.2.4.1
Heating system — tanks with supervised low-temperature alarms connected to constantly attended location	Quarterly	9.2.2.1
Heating system — tanks without supervised low-temperature alarms connected to constantly attended location	Daily*	9.2.2.2
Hoops and grillage	Annually	9.2.4.4
Interior — all other tanks	5 years	9.2.5.1.2
Interior — steel tanks without corrosion protection	3 years	9.2.5.1.1
Painted, coated, or insulated surfaces	Annually	9.2.4.5
Support structure	Quarterly	9.2.4.1
Surrounding area	Quarterly	9.2.4.2
Tank — exterior	Quarterly	9.2.4.1
Temperature alarms — connected to constantly attended location	Quarterly*	9.2.3.2
Vents	Quarterly	9.2.4.1
Water level — tanks equipped with supervised water-level alarms connected to constantly attended location	Quarterly	9.2.1.1
Water level — tanks without supervised water-level alarms connected to constantly attended location	Monthly	9.2.1.2
Test		
High-temperature limit switches	Prior to heating season	9.3.4
Level indicators	5 years	9.3.1
Low-water temperature alarms	Prior to heating season	9.3.3
Pressure gauges	—	Chapter 13
Tank heating system	Prior to heating season	9.3.2
Valve status test		Chapter 13
Water-level signals (high and low)	Annually	9.3.5
Maintenance		
Check valves	—	Chapter 13
Control valves	—	Chapter 13
Embankment-supported coated fabric (ESCF)	2 years or per manufacturer	9.4.6.2
Water level	—	9.4.2

*Cold weather/heating season only.

ENHANCED CONTENT

Collapse

Many of the inspections and tests of water storage tank components specify that they are required during cold weather/heating seasons only. It is important to keep in mind that this is not necessarily a particular time of the year, but rather tied to environmental conditions. If unseasonably cold weather occurs early or late in the normal heating season when freezing is not typically a concern, consideration should be given to performing these inspections and tests to ensure operational reliability of the system.

Table 9.1.1.2: Summary of Water Storage Tank Inspection, Testing, and Maintenance.