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; updated 16 June 2021
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, he asked the following questions:

- 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 his specific needs, and the following additional information was provided:

- The hospitals that he is referring to have between 25 and 500 beds.
- He is looking for options for backup water storage tanks that would be permanently fixed at the hospitals.
    - He noted they have tried water buffalos in the past, but the hospitals did not have the necessary equipment. Therefore, he would like options for large capacity storage tanks that would be on-site, and either above or below ground/ buried.
- He noted that they visited the Florida Keys after a hurricane and that the hospitals had something similar to what he may be looking for. He also said he was willing to consider using a water bladder, but it must have a large enough capacity and easily hook 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 or anecdotal information that they could share with the requestor. Section I below includes comments from our SMEs, and Section II includes links to the resources we collected.

The ASPR TRACIE Team also included resources related to supplemental bulk water supply methods for hospitals in the event that their primary water supply was disrupted. Those resources are listed in Section III of this document.

Note: An updated response was provided to the requestor on 3/12/2018 to include additional comments from ASPR TRACIE SME Cadre members.

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.

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 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 (cleaning, fire suppression, water chillers, etc.) but unexpectedly learned during an actual water outage that its medical air compressors were also water cooled – and so were unusable because of the 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 needs 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.
  - [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).

- The Joint Commission Emergency Management Chapter address 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.
- Due to the cost associated and the two Elements of Performance mentioned above, 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 put E.coli contamination into the public water supply). 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.
- There are tanks online when you search for the term "water storage." I would also suggest using the term "water buffalo" as this is what is referred to by water departments.
- 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 our 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 for the fire trucks carrying water have aluminum or stainless steel tanks on them and hospitals may be able to buy the tanks directly from them.
- Grainger, among other companies, sells water tanks but they tend to be only the 500 gallon capacity or so in my queries.

SME Cadre Member 5:

- [Redacted] group of hospitals in [our jurisdiction] installed a water tank underground, and I believe it could hold 6K or 10K gallons for our reserve tank.
- Essentially clean water would enter continuously, and if needed, the tank could be used to augment if the water supply was not available.

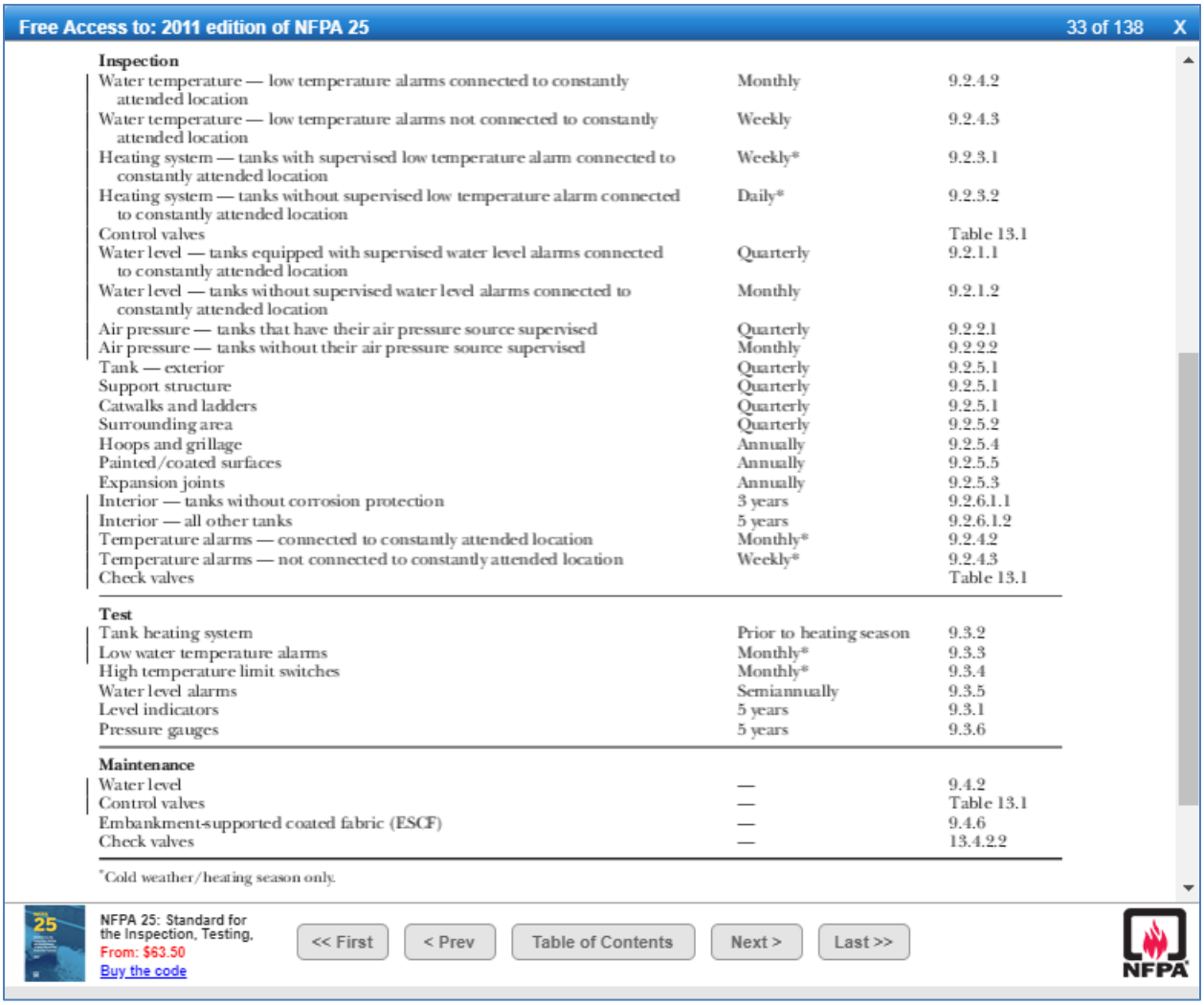
II. Healthcare Facility Water Storage Tank Resources

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

This 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. **Note**: Chapter 7 addresses water storage tanks and will be particularly useful.

National Fire Protection Agency (NFPA). (2011). 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 25-2011: 9.3; Table 9.1.1.2*** for additional guidance on performing tests on water storage. Please see below for a screen shot of this table for your convenience.



Inspection		
Water temperature — low temperature alarms connected to constantly attended location	Monthly	9.2.4.2
Water temperature — low temperature alarms not connected to constantly attended location	Weekly	9.2.4.3
Heating system — tanks with supervised low temperature alarm connected to constantly attended location	Weekly*	9.2.3.1
Heating system — tanks without supervised low temperature alarm connected to constantly attended location	Daily*	9.2.3.2
Control valves		Table 13.1
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
Air pressure — tanks that have their air pressure source supervised	Quarterly	9.2.2.1
Air pressure — tanks without their air pressure source supervised	Monthly	9.2.2.2
Tank — exterior	Quarterly	9.2.5.1
Support structure	Quarterly	9.2.5.1
Catwalks and ladders	Quarterly	9.2.5.1
Surrounding area	Quarterly	9.2.5.2
Hoops and grillage	Annually	9.2.5.4
Painted/coated surfaces	Annually	9.2.5.5
Expansion joints	Annually	9.2.5.3
Interior — tanks without corrosion protection	3 years	9.2.6.1.1
Interior — all other tanks	5 years	9.2.6.1.2
Temperature alarms — connected to constantly attended location	Monthly*	9.2.4.2
Temperature alarms — not connected to constantly attended location	Weekly*	9.2.4.3
Check valves		Table 13.1
Test		
Tank heating system	Prior to heating season	9.3.2
Low water temperature alarms	Monthly*	9.3.3
High temperature limit switches	Monthly*	9.3.4
Water level alarms	Semiannually	9.3.5
Level indicators	5 years	9.3.1
Pressure gauges	5 years	9.3.6
Maintenance		
Water level	—	9.4.2
Control valves	—	Table 13.1
Embankment-supported coated fabric (ESCF)	—	9.4.6
Check valves	—	13.4.2.2

*Cold weather/heating season only.

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

The Joint Commission. (2018). [The Joint Commission Homepage.]

The Joint Commission Standards require the following, which is evaluated during on-site survey during the document review:

> "7. **For automatic sprinkler systems:** Every six months, the hospital tests water storage tank high- and low-water level alarms. The results and completion dates are documented."

Note: For additional guidance on performing tests, see NFPA 25-2011: 9.3; Table 9.1.1.2 noted in the citation above.

III. Hospital Supplemental Bulk Water Supply and Related Resources

Roberson, A.J., Hiltebrand, D. (2010). Emergency Water Supply Planning, Part 1: Hospitals and Health Care Facilities. (Note: click on the Full Text PDF for access). Journal - American Water Works Association. Volume 102, Number 5. Pages 36, 38, 40.

The authors of this article discuss the impact of water supply loss on hospitals and other health care facilities. They also address the Centers for Disease Control and Prevention and American Water Works Association's "Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities" document (provided above) and note the goal of this project was to provide guidance for health care facilities in evaluating their water use and determining how it might be curtailed in an emergency, and in developing an emergency water supply plan for the facility.

Salfarlie, W. (2012). 'Code Blue.' Planning and Managing Emergency Water Systems. Health Facilities Management.

The author of this article addresses the planning process for hospital's emergency water supply, and further breaks it into planning for existing hospitals and for new construction.

Stymiest, D. (2015). How to Plan for Water Outages. Health Facilities Management.

The author lists best practices for healthcare facility planners to consider regarding preventing, preparing for, and responding to water outages.

The American Society for Healthcare Engineering (ASHE). (n.d.) Resource Library.

The ASHE website provides regulatory guidance and other resources related to healthcare facility engineering. Note that access to some resources requires a registered account and fee.

U.S. Department of Health and Human Services, Healthcare and Public Health Sector. (n.d.). Planning for Water Supply Interruptions: A Guide for Hospitals & Healthcare Facilities. (Accessed 3/9/2018.)

This information sheet highlights some of the impacts of a water interruption and poses questions to ask to help facilities prepare for an interruption. Additionally, it provides information on existing resources that can help facilities develop and implement their preparedness strategy, including information related to the Joint Commission Emergency Management Standards for hospitals to have a plan to respond to a 96-hour denial of service for all utilities, including water and wastewater services.

U.S. Environmental Protection Agency. (2011). Planning for an Emergency Drinking Water Supply.

This document addresses the supply of drinking water after a disaster. Five workshops were convened with approximately sixty technical experts who reviewed alternative means of providing drinking water in the event of destruction, impairment, or contamination of the public water supply.