ASPR TRACIE Technical Assistance Request

Request Receipt Date (by ASPR TRACIE): 13 April 2023
Response Date: 28 April 2023
Type of TA Request: Complex

Request:

The requestor asked for information and guidance on the requirements for hospital decontamination showers.

Response:

ASPR TRACIE conducted a search online for resources related to hospital decontamination shower requirements, including those in the ASPR TRACIE Hospital Patient Decontamination, Pre-Hospital Patient Decontamination, and Responder Safety and Health Topic Collections. We also requested input from members of the ASPR TRACIE Subject Matter Expert (SME) Cadre. Section I provides comments from SMEs, and Section II includes resources related to requirements or guidance for hospital decontamination showers.

I. ASPR TRACIE Subject Matter Expert Comments

Please note: These are direct quotes or paraphrased comments from emails and other correspondence provided by an ASPR TRACIE SME Cadre member in response to this specific request. They do not necessarily express the views of ASPR or ASPR TRACIE.

SME Cadre Member 1:

- The intent of decontamination showers at a hospital is technical decontamination (soap and water) for low levels of contaminant and thus high flow rates are not as critical. This is consistent with portable showers used by fire services as well as many hospitals.
- The American National Standards Institute (ANSI) requirements for "drench" showers (required by the Occupational Safety and Health Administration (OSHA) at places of employment where hazardous chemicals are used) mandate specific gallons per minute (gpm) to achieve very rapid dilution of concentrated product immediately after a spill, usually while clothing is still on.
- As per the OSHA Best Practices for Hospital-Based First Receivers of Victims from Mass Casualty Incidents Involving the Release of Hazardous Substances and guidance from Primary Response Incident Scene Management (PRISM), hospital decontamination is designed to address contaminants brought to the hospital on the bodies of living patients and ambulatory shower capacity infers that the concentration and risk of those agents is even less than that contaminating non-ambulatory victims.
- Clothing removal should be performed prior to technical decontamination, as it removes approximately 90% of residual contaminant.

- Most hospital portable decontamination shower solutions rely on garden hoses. A 100 ft 1/2 hose on a standard 40 psi bib delivers about 6 gpm maximum, and the actual use of water through the nozzles is usually significantly less than that. A 1/2-inch standard showerhead is able to deliver about 7 gpm when unregulated. However, this is probably excessive given that the patient will need to shower for at least 5 minutes in order to rinse-soap-rinse.
- Ultimately, determination of "clean" is dependent on the agent, its water solubility, and the area of exposure, but the urgency of decontamination at the hospital does not demand the flow rates that an emergency drench shower does.
- In California, I believe the maximum allowable gpm is 1.8. That said, most showerheads have a flow restrictor plug which is easily removed to allow significantly higher flow rates. Because these are emergency showers, the requestor may wish to take advantage of this to increase the gpm flow to 2.5 or slightly more in order to increase the pace of decontamination in the setting of mass casualties.
- Having inspected all the decontamination showers in our metro area (31 hospitals), I can say that all of the permanent installations use standard showerheads and plumbing. I think the effectiveness of these showers (and the availability) makes them far preferable to temporary solutions.
- If the emergency department (ED) is the destination for exposed employees, this would confer a different level of risk and hospitals may wish to have one "drench" shower and eyewash station available and then have the remainder of the showerheads be standard.
- As hospitals consider remodeling, they may also want to consider the curtain mechanisms (many are not durable and longer curtains are prone to breakage), easy-to-operate mixing valves (and temperature monitor for non-ambulatory decontamination stations as the decontamination team cannot feel temperature well through gloves), grab bar mounting in at least some if not all stations, mounting timers for each shower and soap dispensers at the time construction is performed, and having a final foot wash area prior to entry into the "cold" zone as cross-contamination of common shower area floors occurs.
- The wall surface ideally would be smooth impermeable instead of grouted. An area designated for re-assessment prior to entering the "cold" zone is also preferred when possible.
- Installing fixed capacity as part of a remodel is recommended. Setting up temporary solutions is never optimal from a time and efficacy standpoint as well as patient and provider safety.

SME Cadre Member 2:

- Our healthcare facility recently completed construction of a new biocontainment unit (BCU) and the following table provides the requirements we had to meet for coding including for our shower.
- We have an indoor shower system for decontamination that meets the same criteria we test annually and set the water temperature for 92 degrees.

- We also have 3 pop up tents well that connect to the same water supply as the indoor system including heated water.
- Our healthcare facility has never tested the flow per se but when used we never had too little pressure/flow to get the job done and we were doing 10-20 persons in a tent at a time.

TABLE 604.3 WATER DISTRIBUTION SYSTEM DESIGN CRITERIA REQUIRED CAPACITY AT FIXTURE SUPPLY PIPE OUTLETS		
FIXTURE SUPPLY OUTLET SERVING	FLOW RATEa (gpm)	FLOW PRESSURE (psi)
Bathtub, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	4	20
Bidet, thermostatic mixing valve	2	20
Combination fixture	4	8
Dishwasher, residential	2.75	8
Drinking fountain	0.75	8
Laundry tray	4	8
Lavatory, private	0.8	8
Lavatory, private, mixing valve	0.8	8
Lavatory, public	0.4	8
Shower	2.5	8
Shower, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	2.5b	20
Sillcock, hose bibb	5	8
Sink, residential	1.75	8
Sink, service	3	8
Urinal, valve	12	25
Water closet, blow out, flushometer valve	25	45
Water closet, flushometer tank	1.6	20
Water closet, siphonic, flushometer valve	25	35
Water closet, tank, close coupled	3	20
Water closet, tank, one piece	6	20

SME Cadre Member 3:

- The Plumbing Design for Emergency Department Decontamination Areas resource online, which lists the following:
    - For small emergency departments that have infrequently used decontamination areas, clients may be satisfied with standard 2.5 gpm showers. Larger facilities with higher caseloads typically demand these along with fixed overhead drench showers that discharge at 20 to 30 gpm. It is important to determine which of these your client is expecting early on, as it drives the rest of the systems that serve the area.
    - Additionally, shower controls should be set to deliver water at no more than 100° F and at a pressure that will aid decontamination without causing injury (50 to 70 pounds/square inch (psi) is common).
    - Two shower stations are often not enough to keep up with the caseload the client wants capability for. When determining the number of showers, consider the number of cases the client wants to process per hour, along with a shower time of no less than 15 minutes per patient.
- Additionally, the U.S. Department of Homeland Security's Patient Decontamination in a Mass Chemical Exposure Incident: National Planning Guidance for Communities resource provides references and additional information such as:
    - Using a model decontamination shower, Reifenrath and colleagues achieved significant decontamination of pig and human cadaver skin that had been contaminated with diethyl malonate, thickened diethyl malonate, soman, or thickened soman by showering the skin with water alone. Decontamination efficiency varied depending on several factors, including water pressure and temperature, shower duration, and the specific contaminant.
    - Otherwise, limited information can be gleaned from studies that provide a single data point for a water parameter that is associated with effective decontamination. For example, in the study by Moffett and colleagues (2010), water at 35° C and a pressure between 60 and 70 psi applied to patients for 30-90 seconds resulted in complete removal of an oily contaminant. A hospital-based decontamination system utilizing water at 30° C significantly reduced chemical simulant contamination on patients after a three-minute shower and further reduced contamination after an additional five to ten minute shower with soap; water pressure was not reported. These studies provide support for particular water temperatures, pressures, and durations in effectively decontaminating patients. However, it must be assumed that such results may be dependent on other factors within each of the specific decontamination systems or methods and comparison between studies should be made with caution. The best approach to estimating the optimal parameters for water-based decontamination is to vary the parameters of interest one at a time while controlling as best as possible for all other variables, using the same system or method for decontamination – more such studies are urgently needed.
    - It should also be noted that the optimal water parameters may depend on the specific chemical contaminant; studies should be conducted using a range of types of chemical agents and simulant contaminants.

SME Cadre Member 4:

- The following table is the guideline that SME #4 developed for a hospital patient decontamination shower room at his facilities because he found there really isn't any guidance or aren't any requirements publicly available.

Hospital & FSED Patient Decontamination Shower Room Guideline

Item Description	Quantity	Specifications
Patient Decon. Shower Room	1	Hospital Shower Room dimensions - 18’6” x 8’7” (162 sq. ft.), FSED Shower Room dimensions - 8'5" X 15'5" (132 sq. ft.), Connected to but separate from the ED
HVAC Unit	1	Separate HVAC ventilation system that does not tie into the Hospital/EDs HVAC System
High Velocity Discharge Fan	1	To remove contaminated air from room
Shower Volume & Pressure	3	3 separate shower heads, water must be higher volume than normal shower, with pressure at 60 PSI, connected to a high-volume source
Water Temperature Control	1	Ability to change water temperature within the room (100.4 °F)
Shower Timer	3	One for each showerhead; based on time needed for decontamination of a patient and ensure bladder does not get full
Water On/Off Control	3	Each shower nozzle controlled individually
Shower Nozzles (Heads)	3	High volume spray nozzles that are moveable to assist with directional decontamination
Bladder	1	1,200-gallon tank for large trauma centers, 750 gallon tank for community hospital and FSED, runoff catchment under shower room with alarm that is inside the ED; underground
Light	1	Enough LED lighting so that everyone can see patient(s) and staff; light switch in room and exterior to room
Solid Exterior Door	1	Door must be solid, water resistant, and weather resistant
Glass Paned Interior Door	1	Door into ED must have glass pane so that staff can see decon. Operations; needs to have a switch for frosting windowpane
Intercom	1	Must have an intercom system so that people inside the room can talk to Staff outside the room
Flooring	1	Impermeable that is chemical and slip resistant, minimal or no grout lines
Paint/Walls	1	Impermeable that is chemical and slip resistant, minimal or no grout lines
Wall Portal (Passthrough)	1	Sealed portal passage between room and ED so supplies can be dispensed without contamination; ED can open and place item into it for decon.
Cabinet	1	Wall mounted cabinet, out of way and on opposite side of showers, water resistant, sealed to prevent cross contamination
Signage	3	Bi-lingual signage, instruction for patients
Biohazard Waste Receptacle	1	Wall mounted waste rack that holds biohazard bag below it; mounted in area that won't retain water in bags
Do Not Enter Signage	2	Do not enter signage outside of doors that changes when lock is set
Wall Mounted Seat	1	Wall mounted stainless steel fold away seat; placed on the wall with shower heads and nozzles
Door Weather Stripping	2	Add weather stripping to secure around room doors so that water does not permeate outside the room
Hand Railing	1	Along wall with shower nozzles, sealed, stainless steel, rounded with no sharp edges
Soap Dispenser	3	One per shower nozzle, sealed, automatic hand sensing dispenser
EMS Warning Sign	1	To be located at ED ambulance door / decon shower entrance door
Airmedical Warning Sign	1	If hospital helipad is on roof place sign outside of entrance door

II. Select Resources

American National Standards Institute. (2020). Decontamination Shower Requirements in ANSI/ISEA 113.

This resource identifies the requirements for ensuring that decontamination showers adequately cleanse patients who have been exposed to hazardous materials.

Chilcott, R.P., Larner, J., and Matar, H. (Eds.). (2019). Primary Response Incident Scene Management: PRISM Guidance, Second Edition. U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response, Biomedical Advanced Research and Development Authority.

The PRISM series is comprised of three volumes that can help ensure that patients exposed to potentially hazardous chemicals receive the most effective treatment possible during the initial stages of an incident (after prompt decontamination). Updated in 2019, PRISM incorporates new scientific evidence on emergency self-decontamination, hair decontamination, the interactions of chemicals with hair, and the effects of a combined decontamination strategy referred to as the "triple protocol." The clinical research showed that these three steps, taken together, remove 99.9 percent of chemical contamination.

Cibulsky, S., Kirk, M., Ignacio, J., et al. (2014). Patient Decontamination in a Mass Chemical Exposure Incident: National Planning Guidance for Communities. U.S. Department of Homeland Security and U.S. Department of Health and Human Services.

This guidance can help emergency planners prepare for mass patient decontamination from initial assessment to evaluation of process effectiveness. The authors emphasize the importance of communication and coordination between on-scene and health care facility-based staff.

Huddy, J. (2016). Emergency Department Design: A Practical Guide to Planning for the Future, 2nd Edition. American College of Emergency Physicians. (**NOTE**: This book is for purchase only.)

This book provides guidance on the ED design process and various concepts. **NOTE**: This book was suggested by an ASPR TRACIE SME and is not included in the ASPR TRACIE resource library.

Occupational Safety and Health Administration. (2005). Best Practices for Hospital-Based First Receivers of Victims from Mass Casualty Incidents Involving the Release of Hazardous Substances. U.S. Department of Labor.

The OSHA shares best practices document for hospitals to enhance employee protection and training as part of emergency planning for mass casualty incidents involving hazardous substances.

PHCPPros. (2022). Plumbing Design for Emergency Department Decontamination Areas.

This article provides guidance on plumbing systems, early design considerations, and other design elements as it pertains to ED decontamination areas.

U.S. Department of Veterans Affairs, Office of Construction and Facilities Management. (2021). Emergency Department Design Guide.

This guidance document provides the standard for U.S. Department of Veterans Affairs healthcare facilities planning, design, and construction as it pertains to EDs. **NOTE**: Section 4.2.15 includes information on decontamination showers and patient changing rooms.