



SAFE VENTILATION OF UNDERGROUND FUEL STORAGE TANKS AT THE RED HILL BULK FUEL STORAGE FACILITY

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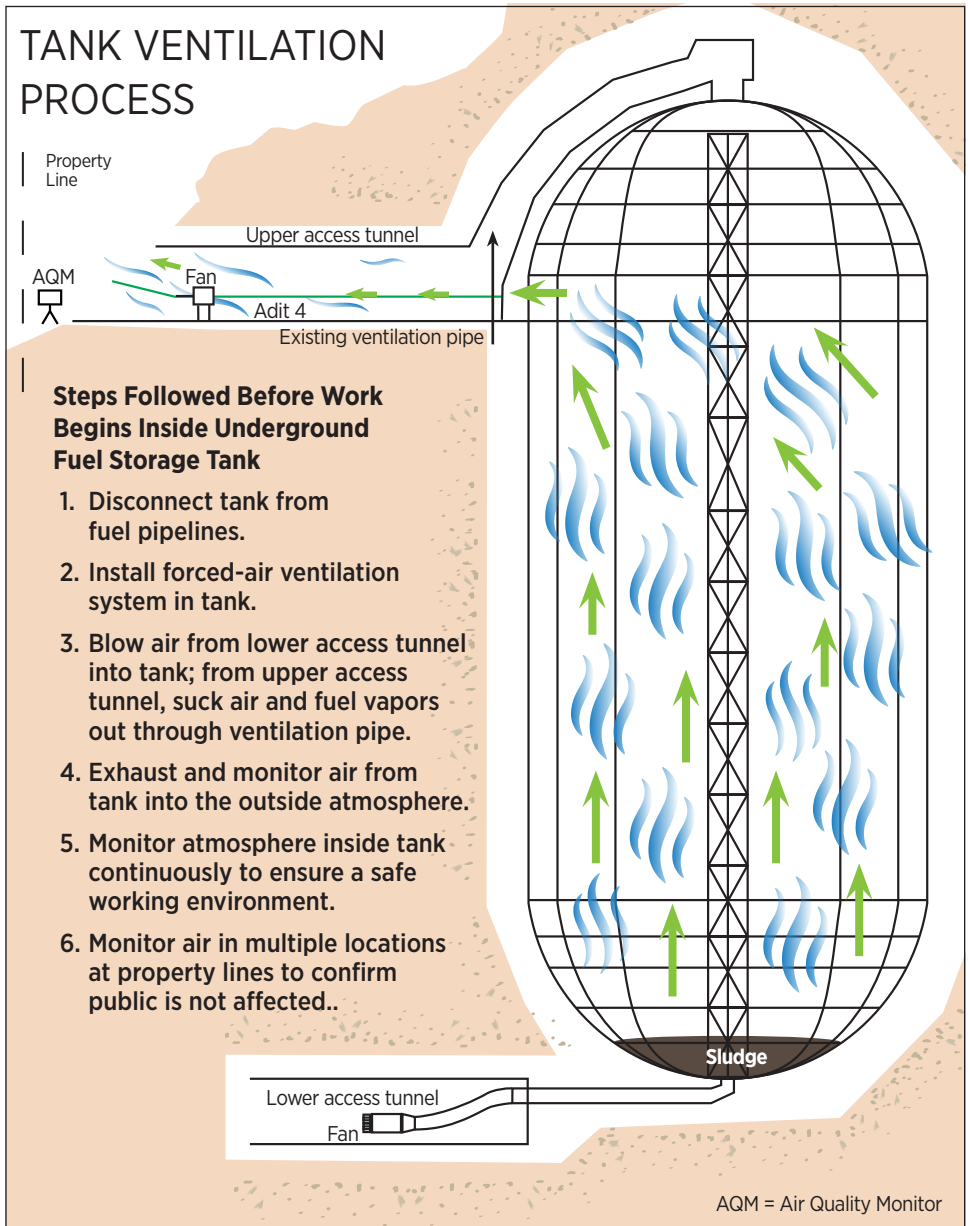
VENTILATION

Underground fuel storage tanks at the Red Hill Bulk Fuel Storage Facility have been successfully ventilated in the past to ensure a safe working environment for personnel responsible for cleaning, inspecting, and repairing the tanks.

Workers cannot safely enter an underground fuel storage tank without proper ventilation, testing, and safety measures in place.

Before any work begins inside the tank, contracted personnel will install a temporary forced-air ventilation system using fans and ductwork to allow workers to enter and clean the tanks. Fans and ductwork are temporarily installed in both the lower access tunnel and the upper access tunnel. The fan in the lower access tunnel blows air into the tank through the pipe connected at the bottom of the tank (referred to as a “nozzle”). The fan in the upper access tunnel sucks air out of the tank, which is then exhausted into the atmosphere through an adit (a horizontal shaft into an underground area used for access). This process typically takes 3-6 weeks to ensure the tank is safe for people to enter. This method has been successfully used during previous cleaning, inspection, and repair projects of the underground fuel storage tanks; use of this method is effective and has not caused any issues.

During the incident on Nov. 20, 2021, a pipeline next to a ventilation fan broke, which forced petroleum odors outside of Adit 3 and into the air in Halawa Valley. This pipeline break was due to the location of the break in the pipe, not due to the method of forced-air ventilation of the tank. Since all fuel has now been removed from the facility, a similar event in the future is not possible.



Ventilating large underground fuel storage tanks is a crucial safety measure taken before any cleaning or repair procedure begins. The safety of personnel, the community, and the environment are paramount during this process.

Steps for Safe Ventilation of Underground Fuel Storage Tanks at Red Hill Bulk Fuel Storage Facility



PHASE I: PREPARATION

Step 1: Tank Isolation and Disabling

- Isolate the tank from filling or transfer pipelines by closing valves and using blind flanges, which are solid disks installed in a piping system to prevent flow from one side of the blind flange to the other.

Step 2: Notification

- Notify the fire department and Honolulu Department of Emergency Management about the planned ventilation.

Step 3: Atmospheric Testing

- Test the atmosphere inside the tank before entry using a combustible gas detector and an oxygen meter.
- Receive certification from a marine chemist or industrial hygienist that the space is safe to enter.
- Ensure flammable vapor levels and oxygen content are within safe limits for confined space entry.

PHASE II: VENTILATION

Step 4: Forced Ventilation

- Enter the underground fuel storage tank to begin working.
- Maintain a safe atmosphere while workers are inside the tank.
- Use a fan to force air into the bottom of the tank.
- Extract (i.e., suck) air out of the tank via a second fan located in the upper access tunnel.

PHASE III: MONITORING AND SAFETY

Step 5: Continuous Monitoring

- Continuously monitor the atmosphere inside the tank using the combustible gas detector and oxygen meter throughout the ventilation process.
- Ensure the space is safe for workers to enter daily. Check for hydrogen sulfide, oxygen, carbon monoxide, and lower explosive limit (the lowest concentration of a substance in the air that could be ignited if heat or a flame is present).

Step 6: Air Quality Monitoring

- Continuously monitor the air quality to ensure emissions from ventilation are maintained at less than 38 parts per million by volume (ppmv) total volatile organics using a one-hour time-weighted average during cleaning.
- Compare measurements against the monitoring standard (Protective Action Criteria-1) established by the U.S. Department of Energy, U.S. Environmental Protection Agency, and National Aeronautic and Space Administration as a public exposure guideline.
- Utilize the information obtained from nine deployed monitoring photoionization detectors (gas detectors used to measure volatile organic compounds) and local weather station.
- Monitor wind conditions using one upwind and eight downwind monitors within the Red Hill Bulk Fuel Storage Facility boundary.
- Report results online as near real-time as able on the Navy Closure Task Force-Red Hill mobile app.

Step 7: Protection of Personnel

- Ensure all personnel involved are equipped with appropriate personal protective equipment (PPE), including flame-retardant clothing and safety harnesses for confined space entry.
- Monitor air quality at property lines in multiple locations to confirm air exceedances are not occurring and impacting the public.

