
Question 26: What are the best practices for entering the vapor space above an internal floating roof in a gasoline tank

Greg Harbison (Marathon Petroleum)

Entering the vapor space above an internal floating roof tank creates a set of somewhat unique safety concerns that must be addressed in a facility's safe work procedures. The primary hazard is entry into an air atmosphere with some level of hydrocarbon vapor or toxics, and liquid hydrocarbon (gasoline for this discussion) beneath the floor, with wiper seals, pontoons, etc. creating a barrier to prevent conditions within the confined space from changing. Some of the specific areas that must be addressed prior to entering this confined space include permitting, atmospheric monitoring, PPE requirements, rescue, tank design or operating status, etc.

Permitting

A confined space work permit is required for entry into the space above an internal floating roof tank. As a best practice, our refineries require approval from a level of supervision above the normal facility permit writer. This ensures the risk associated with the entry is thoroughly reviewed with the expected benefits. Typical activities requiring entry are regulatory inspections, other non-invasive inspections, and minor cold work activities. Confined space work requires an attendant at the point of entry capable of constant communication with the entrants and rescue personnel. Additionally, it is our practice to completely isolate the tank inputs/outputs, and to shut down and lock out all mixers. This practice minimizes the potential for disturbances to the tank's liquid contents, which could create a change to the atmosphere of the work area above. Hot work in covered, internal floating roof tanks is not allowed.

Atmospheric Monitoring

Confined space entry requires atmospheric conditions of 19.5-23.5 % oxygen, less than 10% LEL, and benzene and hydrogen sulfide levels below the permissible exposure limit. As a best practice, respiratory protection in the form of a supplied air respirator is used. Additionally, the confined space entry attendant is also required to utilize this level of respiratory protection. Continuous monitoring for % LEL and oxygen level in the work area of the confined space is also a best practice, particularly near seals, pontoons, or other roof penetrations where hydrocarbon vapors could escape to the work area above. In some cases, mechanical ventilation may also be required. We use air or steam driven equipment to minimize the potential for ignition sources.

Rescue

A rescue team is always required to be available during confined space entry work. Best practices in this area include the entrant's use of full body harnesses and lifelines, avoiding entanglement hazards when in the confined space, the availability of a winch or other rescue device, and the rescue team is stationed at the tank.

Tank Design or Condition

Good ventilation is best accomplished when the vertical space between the floating roof and tank fixed roof is minimized. Our experience is to limit the distance from the floating roof to the fixed roof to ten feet maximum, with less being preferred. It is also our practice to prohibit entering onto a covered floater made of fiberglass, aluminum, plastic or similar materials as the condition of the roof is difficult to ascertain. For roofs made of steel, the inspection and service history of the tank should be reviewed to identify any known areas of concern to avoid. Additionally, entrants are not allowed to descend down to a floating roof that is resting on its legs unless the space beneath the roof has been ventilated and atmospheric testing has been completed and is acceptable. Likewise, the entrance is prohibited if the roof has product on it.

Two final notes are:

1. It is our practice to prohibit confined space entry during lightning storms.
2. For additional details, we recommend a review of API Publication 2026 “Safe Access/Egress Involving Floating Roofs of Storage Tanks in Petroleum Service”.

John Clower (Chevron)

Best practice for vapor space entry is to remove the IFR tank from service in preparation for normal API 653 inspections. CHEVRON will not inspect the vapor space during normal operation of IFR tanks. Decommissioning steps for API 653 inspections include: removal of tank contents, cutter and water washes to remove all sludge, isolation, and preparation for confined space entry.

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