Appendix C: Safe Entry Requirements for Above Ground Storage Tanks

What are the characteristics of gasoline/ethanol storage tanks?
Typically, aboveground gasoline/ethanol storage tanks are "confined spaces" with limited entry through "manways" (relatively small openings in the side or top of the tank). The following potential hazards trigger Permit Required Confined Space (PRCS) characterization:

- Top entry can present a falling hazard.
- The internal structure of tanks can be complex, which may not be apparent from the outside.
- Some tanks have internal floating roofs, which can move and trap workers.
- Tripping hazards may be present.
- The petroleum products typically stored in these tanks pose flammability and toxicity hazards that must be recognized.

Are empty tanks hazardous?
Historically, numerous incidents have involved "empty" tanks.

- Welding in and near tanks can ignite flammable vapors.
- Tanks that do not contain enough oxygen (less than 19.5%) can cause asphyxiation.
- Just because a tank has been "emptied" of its contents does not mean it is free of hazards.
- A tank is never safe for entry until properly and thoroughly evaluated to ensure that there are no actual or potential atmospheric hazards that can affect the oxygen content, flammability, or toxicity.

What keeps entrants safe?
Safe tank entry requires an evaluation of hazards (both physical and atmospheric) at the job site.

- The MSDS/SDS of the tank contents will provide useful information on the hazards of the chemical and recommended control measures.
- Each permit-required confined space atmosphere must be tested using properly calibrated equipment.
- Entry supervisors must know OSHA regulations, industry standards and the specific work to be performed in the tank.
- Understanding safe tank entry requirements and procedures leads to proper preparation and verified hazard control, such as tank isolation, ventilation and proper use of PPE.
- Confined spaces that are mobile, such as a tanker trucks used for transporting fuels must be properly secured, bonded, and grounded.

What are safe entry priorities?

- Do as much work as possible without entry.
- Eliminate or isolate all potential hazards prior to entry.
- Use a written entry program, permits and trained personnel.
- Understand hazards before entry.
- Ventilate if needed, using forced mechanical ventilation.
- Test and inspect to evaluate and verify tank entry conditions.
- Communicate needs and requirements with employees, contractors and others working in the vicinity of the tank.
- Coordinate all activities in accordance with 29 CFR 1910.146(c)(8).

Good Practices for Tank Entry

- Comply with OSHA's Permit Required Confined Space (PRCS) Standard, 29 CFR 1910.146.
- NEVER assume an "empty" tank is free of atmospheric hazards.
- Assume hazards are present until evaluated and verified.
- Evaluate all confined spaces to determine if they are PRCSs.
- Prior to any hot work, ensure that the tank is cleaned and gas-free.
- Check seals.

- Blind or blank piping connected to the tank or use "double block and bleed" to isolate systems. Assure the blind or blank is appropriately sized (includes thickness) to withstand pump pressure.
- If using a bleed line, ensure that it is sized to fully bleed the line it serves (ANSIZ117.1).
- Lockout/tagout of electrical connections. Lockout/tagout rectifiers for any cathodic protection systems connected to tank.
- Use approved low-voltage or ground fault circuit interrupter electrical equipment to reduce potential hazards.
- Disable tank heating and mixers, stirrers and similar mechanical equipment in accordance with lockout/tagout procedures (29 CFR 1910.147).
- Verify that Entry Permit conditions have been achieved.
- Restrict entry into tank .
- Calibrate gas detection meters often, at least before each day's use.
- If tank oxygen content differs from outside air find out why before entry and consider using forced air ventilation to maintain oxygen content between 19.5-23.5%.
- Use approved lighting (electrically certified) to illuminate the interior space.
- Make sure that rescue services equipment is at the site and that personnel are ready, available, and have been evaluated in accordance with 29 CFR 1910.146(k) and 29 CFR 1910.146 Appendix F.
- Make sure that contractors know, understand, and follow safe tank entry procedures and coordinate entry as required by 29 CFR 1910.146(c)(8).
- Use the correct PPE properly when required.
- Enter tanks from ground level where possible.
- Keep track of who is in and out of the tank.
- Look for activities in adjacent areas that could affect confined space conditions.
- Notify nearby areas when doing tank entry.
- Use barriers to keep unauthorized personnel away.
- Consider cutting a large door sheet opening into the side of tank, if feasible.

The Do's and Don'ts of Safe Tank Entry

DO:

- Obtain all necessary permits.
- Post a copy of the permit at the job site.
- Understand the type of tank and its contents before entry.
- Get copies of MSDSs/SDSs for chemicals/products and review them.
- Identify hazards and conduct atmospheric testing of the tank before entry.
- Expect to find product under a tank's bottom or wherever product may become trapped (columns, legs, interstitial spaces between double walls, double bottoms, etc.).
- Use proper ventilation. Ventilate with air flow away from workers and directed away from outside sources of ignition.
- Maintain two-way communication between entrant and attendant.
- Evacuate personnel and cancel permits if conditions change or new hazards are found.
- Ensure that entrants are trained.
- Have competent supervision (29 CFR 1910.146(d)(8)).
- Have a trained PRCS attendant (29 CFR 1910.146(d)(8)).
- Choose "cold work" over "hot work".
- Use approved power tools.
- Know that welding generates fumes and use effective safety measures to preclude workers' exposure.
- Keep all compressed gas cylinders outside tanks.

- Avoid clutter, use good housekeeping.
- Identify any ignition sources.
- Have rescue services available to respond in a timely manner.

DON'T:

- DO NOT enter PRCS without proper permits.
- DO NOT perform hot work without a permit.
- DO NOT work where the concentration of a flammable chemical is "too rich to burn".
- DO NOT depend on 19.5% oxygen as a "safe" atmosphere.
- DO NOT ignore health concerns.
- DO NOT enter tanks without training and authorization.

Key References for Work Inside Aboveground Storage Tanks

OSHA Standards:

- OSHA 29 CFR 1910.146: Permit-Required Confined Spaces and 29 CFR 1910.1200, Hazard Communication standard.

Other Resources:

- OSHA Publication 3138: Permit-Required Confined Spaces
- API STD 2015: Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks
- API RP 2016: Guidelines and Procedures for Entering and Cleaning Petroleum Storage Tanks
- NFPA 326: Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair
- STI/SPFA SP001: Standard for Inspection of Aboveground Storage Tanks
- ANSI/ASSE Z117: Safety Requirements for Confined Spaces

For more information on regulatory guidance, visit OSHA Standards and Publications at www.osha.gov or visit your state's Department of Labor. Non-regulatory confined space entry information can be found in the standards, publications or books from API (www.api.org), the National Fire Protection Association (www.nfpa.org), the Steel Tank Institute (www.steeltank.com) the American National Standards Institute (www.ansi.org), the American Society of Safety Engineers (www.asse.org), the American Industrial Hygiene Association (www.aiha.org) and the National Institute for Occupational Safety and Health (www.cdc.gov/niosh).

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The information in this appendix was adopted (with some modifications) from Safe Tank Entry When Entering Aboveground Storage Tanks **(**Fact Sheet, API, 2008).