



OKLAHOMA CORPORATION COMMISSION
PETROLEUM STORAGE TANK DIVISION

UST
PERMANENT
CLOSURE
GUIDEBOOK

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The purpose of this Guidebook is to encourage **safe** underground storage tank (UST) removal. Underground storage tanks that have contained petroleum products are dangerous. Accidents at UST removal sites have almost always been avoidable. Proper work practices and a healthy respect for the product you're working with will keep you, your workers, passers-by *and the environment* safe. **This is merely a guidance document and should be used for instructional purposes only. This document does not encompass all of the rules or reference documents required by the Oklahoma Corporation Commission Petroleum Storage Tank Division. You must follow all of the Oklahoma Corporation Commission rules and reference documents.**

RULES & REGULATIONS

OCC/PSTD UST Removal Rules - Oklahoma State Law gives the Oklahoma Corporation Commission (OCC) Petroleum Storage Tank Division (PSTD) the responsibility to regulate petroleum storage tanks. This includes removal of UST's.

Oklahoma Administrative Code (OAC) 165:25 is the Oklahoma Corporation Commission's General Rules and Regulations Governing Underground Storage Tanks. The paragraphs that relate specifically to UST removal are:

- **165:25-2-131 Tank removal and closure** - requires you to give the PSTD 14 days notice before removing a UST. It also requires that tanks be removed from the ground unless there is an overwhelming reason why they can't be removed. All of the tank system piping must also be removed. If you've given the 14 days notice and must change your schedule, you must give the PSTD 48 hours notice of the new date. You may send an email or re-submit your scheduling form. Failure to notify the PSTD of a change in schedule may result in a fine or penalty.
- **165:25-2-131 Underground storage tank removal** - provides that a PSTD Licensed UST Remover must remove all UST's.
- **165:25-1-102 Licensing of Underground Storage Tank Removers** - requires that PSTD Licensed UST Removers complete four hours of approved continuing education every two years to maintain your license.
- **165:25-3-65 Assessing the site at closure or change in service** - Sampling must be under the supervision of a PSTD Licensed Environmental Consultant. Laboratory results above action levels must be reported to the OCC within 24 hours of receipt and they may or may not result in further investigation.
- **165:29-3-65 Assessing the site at closure or change in service** - requires that native soil be sampled at all UST tank and line removals. This sampling must also be

under the supervision of a PSTD Licensed Environmental Consultant. If the backfill has to be disposed due to contamination, the tank owner may be reimbursed.

The Occupational Safety and Health Administration (OSHA) - has rules that you must be familiar with. In one way or another, UST removal will be covered by OSHA. Under certain circumstances, OSHA Standard 1910.120 applies. This is the Hazardous Waste Operations and Emergency Response (Hazwoper) standard of 29 CFR.

If you are removing tanks for any of the following reasons your activities would fall under 1910.120:

- A government body is requiring removal because of a potential threat to the environment or the public; or
- Removal is necessary to complete a corrective action; or
- A government body has declared the site to be uncontrolled hazardous waste; or
- There is a need for emergency response.

In these cases above, 1910.120 (a)(1)(i) through (iii) or 1910.120(a)(1)(v) will apply.

If the Hazwoper standard does not apply, other OSHA standards will be applicable, including section 5(a)(1) of the Occupational Safety and Health (OSH) Act of 1970.

Section 5(a)(1) says every employer shall provide his employees a place of employment “free from recognized hazards that are causing or are likely to cause death or serious physical harm...”

To that end, every employer must comply with occupational safety and health standards that are promulgated under the OSH Act.

Employees, too, have a responsibility under this Act to comply with all applicable safety and health standards and all “rules, regulations and orders issued pursuant to this Act which are applicable to his own actions and conduct.”

The American Petroleum Institute (API) - Recommended Practice (RP) “Closure of Underground Petroleum Storage Tanks” covers UST removals. The OCC incorporates this RP as a reference in its UST rules.

The National Fire Protection Association (NFPA) - covers UST removal in sections 2.6.5.3 and 2.6.5.4 of NFPA 30, Flammable and Combustible Liquids Code, 2000 Edition. The OCC also incorporates NFPA 30 as a reference in its rules. It is a detailed list of removal procedures and bears repeating here:

2.6.5.3 Permanent Closure in Place. Tanks shall be permitted to be permanently closed in place if approved by the authority having jurisdiction. All of the following requirements shall be met:

- (a) All applicable authorities having jurisdiction shall be notified.
- (b) A safe workplace shall be maintained throughout the prescribed activities.
- (c) All flammable and combustible liquids and residues shall be removed from the tank, appurtenances, and piping and shall be properly disposed of.
- (d) The tank shall be made safe by either purging it of flammable vapors or inerting the potential explosive atmosphere in the tank. Confirmation that the atmosphere in the tank is safe shall be by periodic testing of the atmosphere using a combustible gas indicator, if purging, or an oxygen meter, if inerting.
- (e) Access to the tank shall be made by careful excavation to the top of the tank.
- (f) All exposed piping, gauging and tank fixtures, and other appurtenances, except the vent, shall be disconnected and removed.
- (g) The tank shall be completely filled with an approved inert solid material.
- (h) The tank vent and remaining underground piping shall be capped or removed.
- (i) The tank excavation shall be backfilled.

NOTE: As explained earlier, the OCC PSTD will only approve closure in place if there is an overwhelming reason why a tank can't be removed. As you will see in the next section, however, (a) through (e) of the above section also applies to tank removals.

2.6.5.4 Removal and Disposal. Underground tanks shall be removed in accordance with the following requirements:

- (1) The steps described in 2.6.5.3(a) through (e) shall be followed.
- (2) All exposed piping, gauging and tank fixtures, and other appurtenances, including the vent, shall be disconnected and removed.
- (3) All openings shall be plugged, leaving a ¼" opening to avoid buildup of pressure in the tank.
- (4) The tank shall be removed from the excavated site and shall be secured against movement.
- (5) Any corrosion holes shall be plugged.
- (6) The tank shall be labeled with its former contents, present vapor state, vapor-freeing method, and a warning against reuse.
- (7) The tank shall be removed from the site promptly, preferably the same day, but within 72 hours.

The API Recommended Practice for tank removal, and the NFPA Standard for removal and disposal, will be relied upon heavily in this Guidebook.

NOTIFICATIONS

When to notify - at least 14 days prior to the start of tank and/or line removal activities you must submit a PSTD Scheduling Form, located on OCC's website, via email to pstscheduling@occemail.com. A confirmation number will be emailed back to you as verification that the form was received. If you do not receive a confirmation number, you should contact the PSTD at (405) 521-4683 for verification. If you have to reschedule the removal project, you must notify the PSTD at least 48 hours before the new start date.

When to begin the job - the date that you provided when you called in the notification. You cannot start the removal process prior to the scheduled date. Failure to notify the PSTD of a change in schedule may result in a fine or penalty.

HEALTH CONSIDERATIONS

Inhaling high concentrations of petroleum vapors can have effects that range from dizziness to unconsciousness. And, benzene and tetraethyl lead are known cancer-causing agents. Although lead has not been used in gasoline since the mid 1980's, lead residues may still be present in underground tanks and in the soil around the tanks.

To minimize exposure to these hazardous substances:

- Avoid skin contact and inhaling the vapors.
- Keep petroleum liquids away from your eyes, skin and mouth.
- Use soap and water or waterless hand cleaner to remove any petroleum product that comes in contact with your skin. Do NOT use gasoline or other solvents to remove oil and grease from you hands.
- Promptly wash petroleum-soaked clothing and properly dispose of rags.
- Keep work areas clean and well ventilated.
- Clean up spills promptly.

FIRE & EXPLOSION CONSIDERATIONS

You should expect flammable or combustible vapors to be present in the work area. These vapors could reach the explosive range before venting is complete and a safe atmosphere is reached.

Make these precautions part of your daily routine during UST projects:

- Eliminate all potential sources of ignition from the area. Some examples of ignition sources at a UST site are smoking materials, non-explosion proof tools, electrical equipment and internal combustion equipment.
- Prevent a discharge of static electricity during venting of UST's. Be sure that all equipment used during venting is grounded. It is good practice to ground to the tank AND to the earth.
- Prevent vapors from accumulating at ground level. Keep all tanks vented at least 12 feet above ground surface until ready to remove them from the excavation. Also, check weather conditions before beginning a project. Humid weather and calm winds can be especially dangerous.

Gasoline vapors are heavier than air and will tend to stay close to the ground surface unless other forces, such as wind, are helping to disperse them. This is especially critical during tank removals on a calm day. You should consider using construction-size portable fans to help disperse vapors on these days.

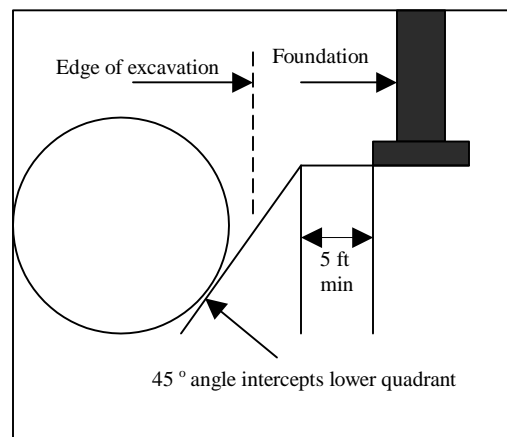
SITE SAFETY

Plan Ahead - leave yourself enough room. Look at the whole site. Are there overhead obstructions, such as power lines, *or a canopy*?

Will any nearby buildings interfere with the excavation?

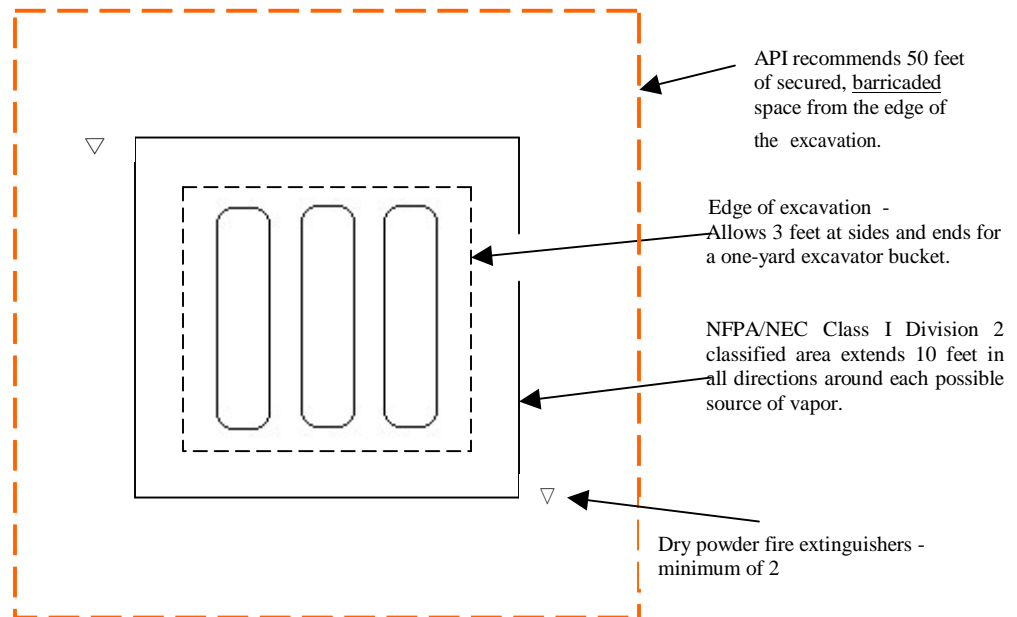
The same formula for installing a UST near a building foundation applies to the removal excavation:

- Minimum distance of 5 feet from the edge of the excavation to the bottom of the building foundation.
- Then, the 45° line should strike the lower quadrant of the tank, as shown in the drawing here.



If you can't meet this guideline, you may have to shore the side of the excavation nearest the building. Soil conditions and other factors will affect this decision -- a decision that should be made by a professional engineer.

Lay out the project on paper. This exhibit (below) is recommended by The American Petroleum Institute (API).



Erect and maintain barricades - Barricade as large an area as possible. API recommends 50 feet in all directions. Brightly colored barricade mesh fencing may be more expensive, but it's more effective. Stay away from "Grand Opening" pennants. They convey the wrong message!

Erect effective barricades - the set up on the left would be better if the A-Frames were spaced closer together. Even then, they're not very effective at keeping pedestrians out. The mesh fence on the right is more visible *and* a more effective pedestrian barricade

Traffic flow is another consideration when barricading your project. Tank removals often take place at locations that are open for business. Arrange your barricades so customers can see where they are *supposed to go* just as easily as where they are *not supposed to go*.

Fire extinguishers should be your first priority at all UST removals.

Class B dry chemical extinguishers should be used on gasoline fires. The numerical rating of a fire extinguisher states the approximate number of square feet of a flammable liquid fire a non-expert person can expect to extinguish. A **40:B** extinguisher should extinguish 40 square feet of a flammable liquid fire. We recommend a minimum of two 40:B fire extinguishers. Locate them at opposite corners of the project so they can be reached quickly. Check them every day to be sure they haven't been tampered with and are fully charged. Train your personnel in their proper use.

A site-specific Health And Safety Plan (HASP) must be prepared, must be kept on site and must address the safety and health hazards of each phase of the project. The HASP must provide for pre-entry briefings before beginning any site activity and at any other time it becomes necessary to keep employees aware of conditions. The Plan must designate a site safety and health supervisor. The safety supervisor must have the authority to shut the project down if personnel health or safety is jeopardized. The Plan should also include a communications system, which can be hand signals if they are clearly understood. An emergency communications system, such as sounding a motor vehicle horn an established number of times, must be clearly understood. The HASP should be evaluated at least daily and must be updated if changing conditions warrant.

Employees must be advised of the chemical, physical and toxicologic properties of each substance that is known or expected to be present on the site.

Sloping or shoring the excavation - is required by OSHA under most circumstances *if* you are going to have people working *in* the excavation. Besides the added cost of sloping or shoring, you should consider an approach that doesn't require your employees to enter the excavation anyway.

Excavations are one of the most hazardous activities in the construction industry. The primary accident at an excavation site is cave-in. According to OSHA statistics, someone is usually killed in a cave-in. Excavations don't have to be deep, such as a tank pit, to be dangerous. Workers have been killed in trench cave-ins. You don't have to be buried to be killed. Trench cave-ins often result in massive lung and liver injuries; you can be *crushed* to death.

The OSHA Standard 29 CFR 1926.650-652 requires that employees in an excavation be protected from cave-ins. There are four sloping options available:

- Slope the excavation at an angle not steeper than 1-½ feet horizontal to 1 foot vertical –expressed as 1-½:1. (1926.650-652, Subpart P, Appendix B).
- Slope the excavation in accordance with the OSHA simplified soil classification system, which ranks soils according to their stability. (1926.650-652, Subpart P, Appendices A and B).
- Use a design created and sealed by a registered professional engineer *in the state of the excavation*.
- Use a site-specific design sealed by a registered professional engineer *in the state of the excavation*.

An excavation that will be entered can be sloped ½:1 (½ foot horizontal to 1 foot vertical) if it meets these criteria:

- (1) the excavation is in Type A soil (the most stable soil type after rock);

- (2) the excavation will not be open more than 24 hours; and
- (3) the excavation is no deeper than 20 feet.

Even in stable soils, however, if the excavation will be open longer than 24 hours, the sides must be sloped at least ¾:1.

Another good reason - to keep your employees out of the tank pit: Not only is it more expensive to slope or shore an excavation than to plan your removal project so no one has to enter the tank pit, you are also putting employees into a Confined Space. OSHA requires specific training for employees who must work in a Confined Space situation.

A Confined Space is a space with limited ventilation, potential to accumulate or contain a hazardous atmosphere, exits that are not readily accessible, not meant for continuous human occupancy. This includes excavations and trenches. There are many hazards associated with working in a Confined Space. Among them: ladder tip over, buried utilities, falling equipment or material, and unplanned rescues. Instinctively rushing in to help someone who has become trapped in a Confined Space too often makes an already bad situation worse. Citing OSHA statistics again, half of all workers who die in Confined Space accidents *are trying to rescue others*.

Working in a Confined Space requires training. Performing a rescue from a Confined Space takes more training. If employees absolutely must work in an excavation, train them in safety and self-rescue. Comply with *all* of the OSHA rules for Confined Space entry and activity. It's someone's life!

You must provide ladders, ramps or other safe means of exit in all trenches that are 4 feet deep or more. The means of exit must be within 25 lateral feet of workers. An earthen ramp can only be used if a worker can walk it in an upright position and only if a competent person has evaluated it.

Did You Know? The fatality rate for excavation work is 112% higher than the rate for general construction.

PRE TANK REMOVAL PROCEDURES

Because of the nature of the flammable or combustible liquids that are stored in underground storage tanks, hazardous conditions can be expected to exist in the tank removal area. All personnel should be familiar with the potential hazards and be aware of the appropriate health and safety measures needed to ensure a safe working environment.

Safety concerns don't end once the tanks are out of the ground. Transportation must be handled safely and storage of used tanks that are waiting to be destroyed must be done in a safe manner.

Tanks can and will regenerate explosive vapors regardless of how they are cleaned.

A used tank will not be vapor-free as long as it is a tank.

The EPA and the PSTD require that tank closures be performed in accordance with a national standard. The EPA singles out API 1604 as a guidance document that may be used to comply with their requirements for tank removal and disposal of underground storage tanks. As noted earlier in this Guidebook, we are relying heavily on API 1604 and the NFPA Standard for removal and disposal to help you accomplish a safe tank removal.

Safety precautions were covered earlier. Observe all of the special precautions. They're good for you and for the environment.

You should have already made the **CALL OKIE** telephone call to get your underground utilities flagged.

OSHA requires that you determine the location of any underground utilities “that reasonably may be expected to be encountered” before you open the excavation. It’s one of the violations OSHA emphasizes [29 CFR 1926.651(b)(1) and (b)(2)].

Oklahoma law also requires that you notify utility owners before excavating “in a highway, street, alley or other public ground or way, a private easement, or on or near the location of the facilities of an operator” of public utilities. If there are utilities in the area of your excavation, Oklahoma Statute Chapter 142 requires you to **call first**.

Both laws also require that you **determine the exact location** of a utility before you excavate in the approximate location that was indicated by the utility locators. Remember that utility locators only have to mark within three feet on either side of a utility to have done their job.

The CALL OKIE service is available to all contractors at no charge. You must call them at least 48 hours before digging, excluding weekends and holidays. Do NOT call them more than 10 days in advance. When you do call, it is a good idea to ask them which utility companies they notify in your specific area. In some cases, a utility may be owned by a non-Call Okie member. In that case, you would have to notify the utility yourself.

CALL OKIE: In the 405 area code, the number is **840-5032**
Outside the 405 area code, call **1-800-522-6543**

The same state law that requires utility owners to register their utilities and you, the contractor, to notify before excavating, also requires these colors to identify the utility locations.

Operator and Type of Product

Identifying Color

Electric Power Distribution & Transmission	Safety Red
Municipal Electric Systems	Safety Red
Gas Distribution & Transmission	High Visibility Safety Yellow
Oil Distribution & Transmission	High Visibility Safety Yellow
Dangerous Materials, Product & Steam Lines	High Visibility Safety Yellow
Telephone & Telegraph Systems	Safety Alert Orange
Police & Fire Communications	Safety Alert Orange
Cable Television	Safety Alert Orange
Water Systems	Safety Precaution Blue
Slurry Systems	Safety Precaution Blue
Sewer Systems	Safety Green

ELECTRICAL SAFETY

Disconnect all electrical service going to, under or through the UST area. Don't just turn off the switches. **Pull the breakers.** Use your voltmeter to confirm. Don't take chances.

A licensed electrician may have to do all electrical work, including disconnects. Check with local authorities.

DRAINAGE OF PRODUCT

Drain product piping back into the tank. If the piping system is pressurized, you will have to remove or open fully the functional element check valve.

If the system is suction, you may encounter a check valve other than the one directly under the pump. If so, you won't be able to drain the lines until you have excavated to the top of the tank and removed the check valve.

Use small amounts of water to flush the pipe. Use no more than 1 gallon of water for every 10 feet of 1-1/2" pipe; 2 gallons of water for 10 feet of 2" pipe.

You can also flush the pipe with nitrogen, which would be more expensive but would generate less waste that has to be removed from the tank.

Avoid spilling fuel in the excavation area.

Remove all liquids and residue from the tank. Use explosion-proof or air-operated pumps. If you rinse the tank with water, you'll be able to remove more of the residue. Don't add more than 1 inch of water to the tank.

Be careful while pumping. It is likely that fresh air will enter the tank and bring the atmosphere inside the tank into the flammable range. Ground all pump motors and

suction hoses to prevent a buildup of static electricity. You must ground your equipment to the tank, but it is also a good idea to ground to the earth as well.

You may have to use a hand pump to remove the last few inches of liquid from the tank bottom.

If you use a vacuum truck, the area around the truck must be vapor-free. Locate the truck upwind of the tank. The suction hose must be grounded. The vacuum pump exhaust gases must be vented through a line of adequate size and at least 12 feet above ground surface. The vacuum vent should be located downwind of the truck and tank area.

EXCAVATING

Remove the concrete and/or asphalt cover over the tank. It is a good idea to separate this material from the backfill material you'll be excavating. This will minimize the amount of material that may need special handling due to contamination. Select your on-site storage area carefully so you'll avoid having to relocate any of the removed material to gain access to the tank excavation. All material must be kept at least 2 feet from the edge of the excavation or it must be secured to keep it from falling into the hole or causing a cave-in.

Excavate to the top of the tank. Remove all tank top equipment. This includes the fill pipe and drop tube unless you're using an eductor to vapor-free the tank, automatic tank gauge equipment and riser, vapor recovery equipment, submersible pump turbine and pump head. Remove all piping and conduit that is accessible and uncovered, **except the vent line**. This should include all piping that extends into the tank excavation.

The vent line must remain connected until the tank is purged. Plug all other tank openings as you remove the tank-top equipment and risers. This will force the vapors to exit through the vent during the purging process. Keep in mind that you are creating an atmosphere that is more explosive than normal while you're purging the tank.

The objective at this stage of the project is to access and remove everything possible before continuing the excavation. This will avoid having to put personnel inside the excavation during any part of the removal project. If you avoid having personnel inside the excavation, you can avoid the sloping or shoring requirements you otherwise would have to comply with.

Four things must exist at the same time in order to produce a fire. . .

- Enough **oxygen** to sustain combustion,
- Enough **heat** to raise the material to its ignition temperature,
- A combustible material (**fuel**), and
- The chemical reaction that is fire.

The “**Fire Triangle**” might more appropriately be called the “**Fire Tetrahedron.**”

During the best of situations, explosive atmospheres are going to regenerate inside the tank. Continue purging as long as possible and monitor *often*. The important thing to remember: take away any of these four things and you will not have a fire. Keep all ignition sources (the Chemical Reaction face of the tetrahedron) a safe distance away and you will not have a fire. These include smoking material, tools that can cause a spark, non-explosion proof electrical equipment and internal combustion equipment.

PURGING OR INERTING

Purging is the **removal** of flammable vapors from a tank.

Inerting is the **removal** or **displacement** of oxygen from a tank.

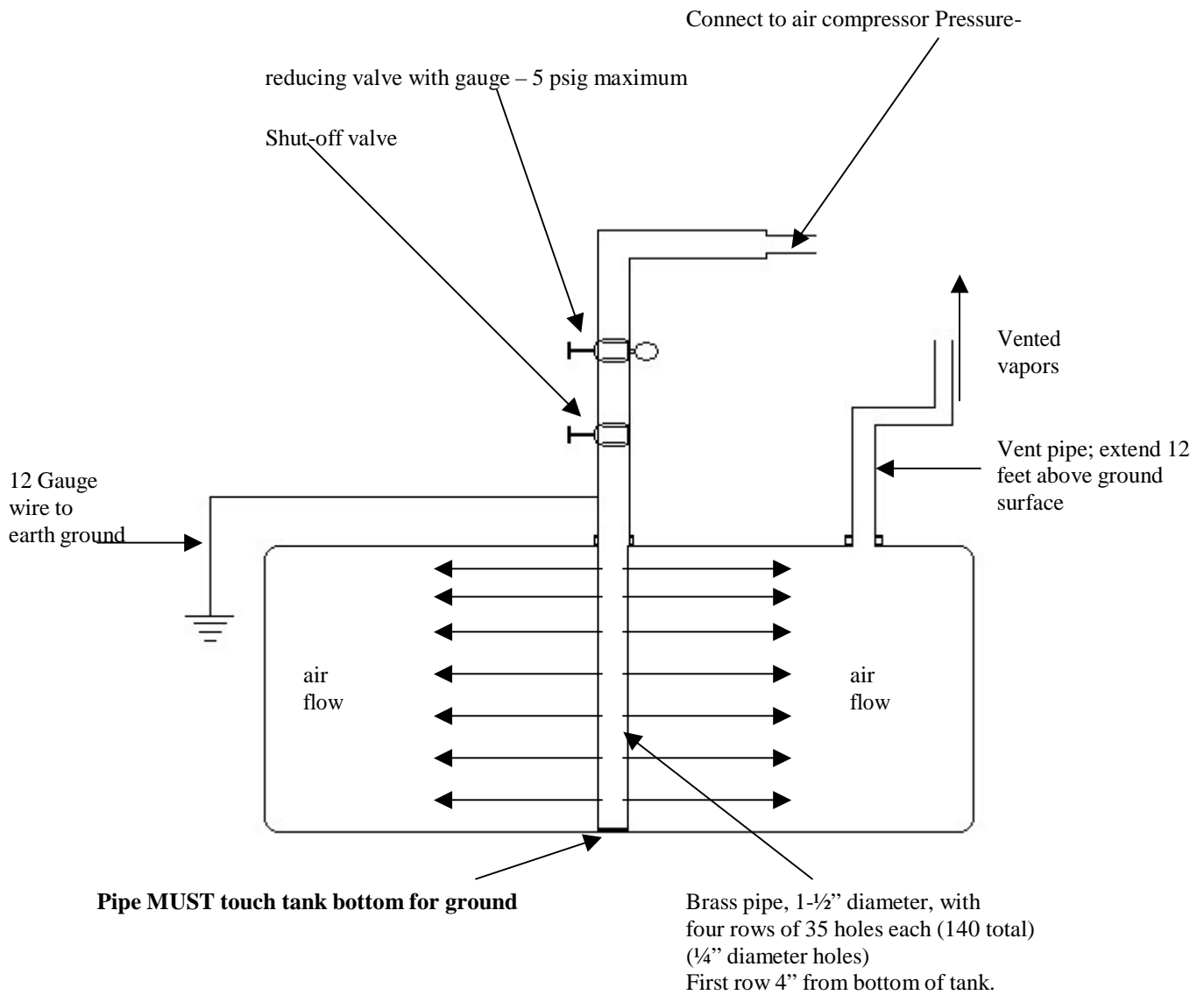
CAUTION must always be exercised when handling or working around tanks that have stored flammable or combustible liquids

- Immediately before beginning work in the tank area or on the tank, check for vapor concentrations with a combustible gas indicator (CGI).
- Even after purging or inerting, a tank can regenerate flammable vapors. Check them often.
- Both purging and inerting cause flammable vapors to be expelled from the tank. Vent all vapors at least 12 feet above grade and 3 feet above any adjacent roof lines.
- Keep the work area free of all sources of ignition.
- Never enter a tank that has been inerted with carbon dioxide (CO₂) or nitrogen (N₂). Either of these methods depletes the oxygen.
- Ground all equipment and use low air or gas pressures to prevent a buildup of static electricity.
- NEVER discharge a CO₂ fire extinguisher into tanks containing a flammable vapor-air mixture.
- If a tank has been inerted, a combustible gas indicator may be misleading. Most CGI's require 10% by volume oxygen to operate properly. Use an oxygen indicator to assess a tank that has been inerted.
- Never let the pressure inside a tank exceed 5 pounds per square inch gauge (psig) when introducing compressed air or gases.

- Pressure gauges are most reliable in their mid-range. When working in the 5 pound range, you should use a gauge with a maximum range of 15 pounds.

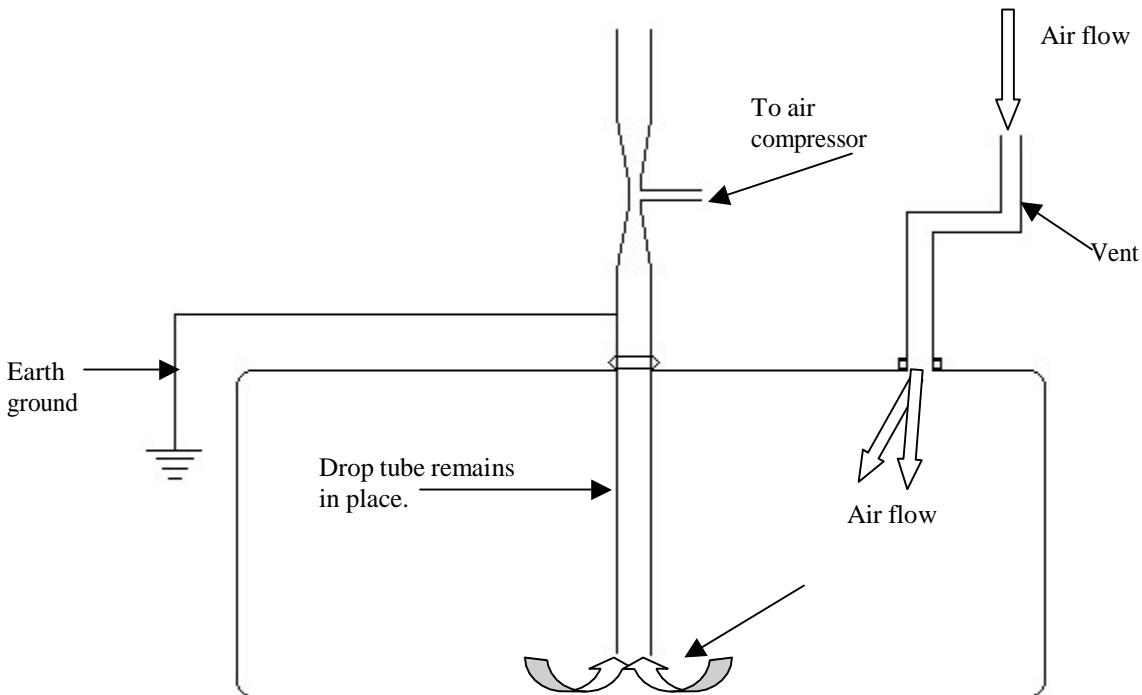
Purging a tank with a diffused air blower. . .

Fresh air is pumped into the tank from the air compressor. This forces the explosive vapors out of the tank through the vent. Vent must be at least 12 feet above the ground. All other tank openings must be plugged. The drop tube and all other in-tank equipment must be removed. The diffuser must be grounded to the tank bottom AND to the earth. Pressure inside the tank should never exceed 5 psig. Always work with a dependable pressure gauge and check it often during the process. Continue purging as long as possible up to actual tank removal.



Purging a tank with an eductor-type air mover. . .

Air is pumped into the eductor from the air compressor. The venturi construction of the eductor causes a vacuum effect at the bottom of the tank. This draws the explosive vapors out of the tank through the top of the eductor, and draws fresh air into the tank through the vent. The top of the eductor must be at least 12 feet above ground surface. The drop tube is left in place for this method. All other tank openings must be plugged. The eductor should be grounded to the tank AND to the earth. Continue purging as long as possible up to actual tank removal.



Inerting a tank with dry ice. . .

One of the most-widely used methods of inerting a tank is by adding Dry Ice, which is carbon dioxide in solid (frozen) form.

API recommends adding **1-½ to 2 pounds of Dry Ice per 100 gallons** of tank capacity.

The Dry Ice should be shaved or crushed, and it must be distributed evenly over the greatest possible area of the tank.

It should at least be inserted through tank openings at each end and in the center. The tank openings should be plugged immediately after inserting the Dry Ice. As the Dry Ice

vaporizes, flammable vapors will be expelled from the tank and be introduced into the surrounding atmosphere.

Observe all normal safety precautions during this phase of the project. Make sure that all of the Dry Ice has evaporated before proceeding.

Looks are deceiving. Dry ice is not as “cool” as it looks.

Dry Ice is -109.3° F (-78.5° C). Traditional ice is 32° F (0° C). Skin contact can produce severe burns.

Some tips on the handling of Dry Ice:

- Dry Ice doesn't melt - it sublimates. Sublimation is the process of going directly from a solid to a gas. Dry Ice by- passes the liquid form, giving it its name "Dry" Ice.
- Dry Ice will sublimate at a rate of 10 pounds every 24-hours in a standard insulated container. The more Dry Ice you have stored in the container, the longer it will last.
- Plan to pick up your Dry Ice as close as possible to the time you will need it. Avoid opening and closing the container as much as possible.
- If you remove only a portion of the Dry Ice from a container, fill the empty space with wadded newspaper or paper bags. “Dead” air space will cause the Dry Ice to sublimate faster.
- Do not store Dry Ice in an airtight container without proper ventilation. The carbon dioxide gas can cause an airtight container to explode.

Inerting a tank with an inert gas. . .

An inert gas such as carbon dioxide (CO₂) or nitrogen (N₂) will displace the oxygen in the tank. You should not use this method, however, if you may have to enter the tank for any reason, because the tank atmosphere will be oxygen deficient.

Introduce the inert gas through a tank opening on the opposite end from the vent. The supply line must be placed near the bottom of the tank.

Use low pressure to avoid generating static electricity, and don't exceed 5 pounds per square inch gauge (psig).

Ground the equipment and the tank.

Never discharge a CO₂ fire extinguisher into a tank containing flammable vapors. CO₂ fire extinguishers should never be used for inerting flammable atmospheres. Explosions

have resulted from discharging a CO₂ fire extinguisher into tanks containing flammable vapor-air mixtures.

A more dangerous practice is using the exhaust from a diesel-engine, such as a backhoe or trackhoe, to try and inert the atmosphere inside a tank.

Instead of **inerting** the atmosphere inside the tank, you are **enriching** it.

Diesel exhaust contains:

- Carbon monoxide - extremely flammable.
- Nitrogen dioxide - supports combustion, can react violently with water
- Nitric oxide - supports combustion, can react violently with water
- Sulphur dioxide – increase in temperature can cause sudden rise in pressure
- Unburned hydrocarbons

Be extremely careful when using an inert gas to displace the oxygen inside a tank. Inerting can affect the work area by displacing the oxygen *outside* the tank.

TESTING EQUIPMENT

From simple to sophisticated, testing equipment can be potential life savers, if you use them.

The **tank** atmosphere and the **excavation area** should be **tested regularly** for flammable or combustible vapor concentrations until the tank is removed **from the site**.

A properly calibrated combustible gas indicator (CGI) or explosion meter should be used. There are other methods available, such as photoionization and flame ionization detectors and colorimetric detector tubes, but a CGI or explosion meter are the least subjective. More information on the various methods of air sampling is contained in Appendix F.

The people doing the testing must be completely familiar with the instrument and what the readings represent.

If you use a CGI, always test the environment for oxygen content first to be sure you can rely on the instrument. CGI's may be misleading if the tank atmosphere contains less than 5% to 10% by volume oxygen, as would happen if you **inert** the tank.

If the tank was inerted, use an oxygen indicator to determine the oxygen concentration. Readings that show the tank to be oxygen-deficient should be safe. You've removed the oxygen side of the Fire Triangle. A fire needs air with at least 16% oxygen to burn.

Don't take readings through a drop tube. **Do** take readings at a minimum of three levels in the tank; the bottom, center and top.

Readings of 6% to 7%, or less, of the lower explosive limit (LEL) should be obtained before the tank is safe to remove from the ground. Ten percent LEL is the maximum safe level.

TANK REMOVAL FROM EXCAVATION

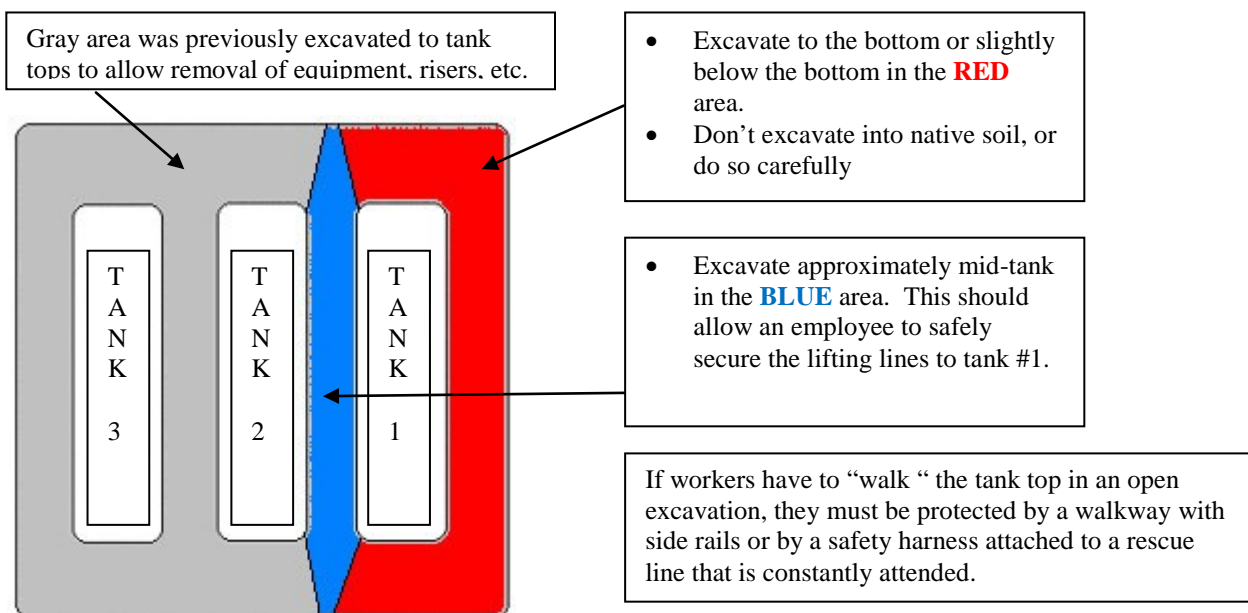
After the tank has been vapor-freed, before removing it from the excavation, remove the vent pipe and install a plug or cap with a 1/4" hole. This hole will prevent the tank from becoming over-pressurized due to temperature changes. (API recommends a 1/8" hole. NFPA recommends a 1/4" hole.)

The tank should always be positioned with this vent plug on top, including during subsequent transport and storage.

All of the other tank openings should already have been plugged and should remain plugged.

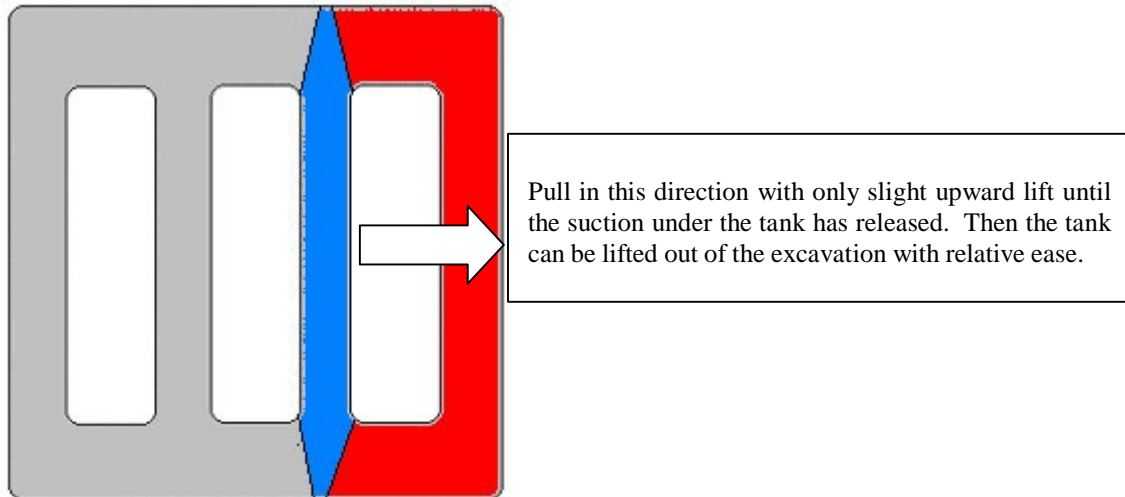
Excavate around the tank to finish uncovering it for removal.

If possible, working from one end of the tank excavation and removing one tank at a time will help you continue to keep your employees aboveground, out of and away from the excavation.



Rock & Roll . . .

Rocking or rolling the tank toward the fully excavated area will cause the suction to be broken and allow relatively easy lifting of the tank.



There are many ways to get a tank out of the ground. . .

- You must use equipment capable of safely lifting the tank. The tank should not be dragged.
- Close all openings and install one ¼” vent.
- Quoting API: “Remove the tank from the excavation and place it on a level surface.”
- No smoking.
- All excavated material must be kept at least 2 feet from the edge of the excavation or it must be secured to keep it from falling into the hole or causing a cave-in.

Piping. . .

Remove all piping. You should already have removed piping that extended into the tank excavation. Use as much care as possible while excavating the piping. It can be very useful if you can identify corrosion holes or loose fittings that may have contributed to contamination at the site. Remember that you should be looking for contamination throughout the project. Dispose of the piping in the same manner as the tank.

Before transporting the tank, it must be labeled. Whatever condition the tank is in, it should contain a warning against its reuse. Lettering must be legible and at least two inches high.

The exact wording is not as important as the information being conveyed.

API recommends this information:

- **TANK HAS CONTAINED LEADED GASOLINE ***
- **NOT VAPOR-FREE**
- **NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR HUMAN OR ANIMAL CONSUMPTION**
- **DATE OF REMOVAL: MONTH/DAY/YEAR**

*Or other flammable or combustible liquid. Use the applicable designation, such as Diesel.

Tanks that have held leaded gasoline, or if the history of the tank is unknown, should also be clearly labeled with the following information:

- **TANK HAS CONTAINED LEADED GASOLINE**
- **LEAD VAPORS MAY BE RELEASED IF HEAT IS APPLIED TO THE TANK SHELL**

Truck It . . .

The tank should be cut up, crushed or removed from the site as soon as possible after removal.

If a tank remains on-site overnight or longer, vapors may be regenerated from any of the liquids absorbed in the tank walls or from residues remaining in the tank.

Always retest for a lower explosive limit below 10% before the tank leaves the site.

Plug any openings in the tank walls that would allow any remaining residues to leak out during storage and/or transportation.

Be sure the tank is properly secured before transporting and that the ¼" vent hole is located at the uppermost point on the tank.

The transporter is subject to all local, state and federal transportation laws.

Store It . . .

Even though a tank has been vapor-freed, **it will not remain vapor-free.**

Hydrocarbons are retained in crevices and under scale inside the tank and can be released over a period of time.

If a tank is placed in storage, **all liquids and residues must be removed**. Only the ¼” vent hole should be left open.

Used tanks should never be stored in an area where the general public may have access.

TANK RE-USE

Tanks can only be reused if they are recertified by the manufacturer.

If a tank is going to be returned to service, the seller must inform the buyer in accordance with federal regulations.

40 CFR 280.22 (g) states:

“Beginning October 24, 1988, any person who sells a tank intended to be used as an underground storage tank must notify the purchaser of such tank of the owner’s notification obligations. . .”.

Tank cannot be used as drainage culverts or for **storing food or liquids** that are intended for animal or human consumption.

Prepare a Bill of Sale to transfer tank ownership. The Bill of Sale should include the purchaser’s acknowledgement that the purchaser assumes all liability of the tank.

The Bill of Sale should include a warning similar to this message recommended by API:

- **TANK HAS CONTAINED LEADED GASOLINE ***
- **NOT VAPOR-FREE**
- **NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR HUMAN OR ANIMAL CONSUMPTION**

***Or other flammable or combustible liquid.**

TANK DISPOSAL

Tanks must be properly disposed when they are no longer fit for storing flammable or combustible liquids. Whether you take them to a scrap iron dealer or some other acceptable facility, enough holes should be made in the tanks to render them unfit for future use. **Use a Bill of Sale or Certificate of Destruction to transfer tank ownership.**

SAMPLING AT TANK REMOVAL

From collecting, to handling, to sanitizing, to preserving, proper soil sampling procedures must be followed to obtain meaningful results.

OCC PSTD Chapter 25 Underground Storage Tank (165:25-2-136) and Chapter 29 Corrective Action of Petroleum Storage Tank Release Sites (165:29-3-65) rules cover soil and/or groundwater sampling at tank removals.

Sampling must be conducted at every tank closure. Chapter 29 rules also cover sampling of the tank excavation backfill. The PSTD may require that backfill be disposed depending upon laboratory analyses.

UST SAMPLE LOCATION REQUIREMENTS:

TANKHOLD

- 1) Under the fill port end of each tank
- 2) Groundwater (not perched zone or storm water) must be sampled if encountered.
- 3) The down-gradient sidewall (if groundwater is present in tankhold, take the sample immediately above the soil-water interface, and 1 to 3 feet into the sidewall).
- 4) Collect samples one to three feet below the tank or outside the tankhold in native soil.

PIPING

- 1) All piping should be exposed. Collect 1 grab sample at each connection or elbow; or at least one grab sample per 20 linear feet of trench.
- 2) Collect samples 1 to 3 feet below trench in native soil.
- 3) If existing piping is being replaced, a line test conducted immediately prior to removal which demonstrates the line(s) are tight may be used in lieu of native soil sampling IF the backfill sample(s) are below action levels. If backfill sample(s) are above action levels, then native soil sampling in line trenches is required to confirm a release.

DISPENSERS

- 1) Collect one sample below each dispenser, on supply side.
- 2) If dispensers are located within 15 feet of each other on same fuel island, collect one sample per fuel island, on the supply side.

BACKFILL

- 1) Sample excavated backfill from tanks and lines to determine if it can be returned to the tankhold and/or trenches. Contact the Technical Division prior to over-excavation of the tank pit. Take 1 composite sample (made up of 10 grab samples) every 50 cubic yards.
- 2) Confirm disposal requirements with the Technical Division once backfill sample results are received.

TANKS CLOSED IN PLACE

- 1) Drill borings within 3 feet of the tank; the number of borings will depend on the number and sizes of tanks buried. See variance application for diagram.
- 2) Place borings in native soil, to a depth of 1 to 3 feet below tank bottoms. Collect a sample at the interval of highest contamination indicated by vapor readings.
- 3) Groundwater must be sampled if encountered.
- 4) Drill a boring every 20 feet along piping runs, at a depth of 1 to 3 feet below trench bottom.
- 5) Drill a boring within 3 feet of each dispenser (supply side). If dispensers are located within 15 feet of each other on same fuel island, collect one sample per fuel island, on the supply side.

Where contamination is most likely to be present is where you should sample.

Sampling must be done under the supervision of a PSTD Licensed Environmental Consultant and the samples must be analyzed by a laboratory approved by the Oklahoma Department of Environmental Quality (ODEQ). If the Licensed Consultant is not present on site, site-specific sample location selection must be discussed with the person collecting samples prior to removal.

Have the samples analyzed for the BTEX constituents Benzene, Toluene, Ethyl benzene and Xylenes, and for Total Petroleum Hydrocarbons Gasoline Range Organics (TPH-GRO) and/or Diesel Range Organics (TPH-DRO).

At an older site, where the product that might have been handled or stored is not certain, you should have the samples analyzed for both TPH-GRO and TPH-DRO. You may also need to test for Total Lead if the UST system has ever stored leaded gasoline. If tanks have stored waste oil, sampling for 8 RCRA metals may be required if TPH results exceed action levels.

A UST Closure Report Form, an amended UST Registration, and Closure Report must be submitted to the PSTD Compliance Division within 45 days of tank removal. All forms are available on the OCC website at www.occ.occweb.com. The Closure Report must include: site map with north arrow, tank pit location and proximity to roads buildings or

other landmarks; piping layout and fuel island locations; soil and groundwater sampling locations; a cumulative table of lab results depicting sample depths and sample identification; lab reports and chain of custody; waste manifests (or certificate of recycling/reuse); certificate of destruction or bill of sale; photographic documentation; and complete summary of all site activities and observations. The UST Closure Report must be signed by the PSTD Licensed UST Remover and the PSTD Licensed Environmental Consultant. The amended UST registration must be signed by the tank owner. All signatures must be original. Consultants are not authorized to sign for tank owners without a power of attorney or similar authorization (attach copy).