

Utah
Underground Storage Tank (UST)
UST Tester
Recertification Guide



November 2008



<http://www.epa.gov/swerust1/overview.htm>

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Underground Storage Tanks

You are here: [EPA Home](#) [OSWER](#) [Underground Storage Tanks](#) [Overview of the Federal UST Program](#)

Overview of the Federal UST Program

What's an UST?

An underground storage tank system (UST) is a tank and any underground piping connected to the tank that has at least 10 percent of its combined volume underground. The federal UST regulations apply only to underground tanks and piping storing either petroleum or certain hazardous substances.

When the UST program began, there were approximately 2.1 million regulated tanks in the U.S. Today there are far fewer since many substandard UST systems have been closed. For the most current statistics available, see the [Corrective Action Measures archive](#). Nearly all USTs at these sites contain petroleum. These sites include marketers who sell gasoline to the public (such as service stations and convenience stores) and nonmarketers who use tanks solely for their own needs (such as fleet service operators and local governments). EPA estimates about 25,000 tanks hold hazardous substances covered by the UST regulations.

Why be concerned about USTs?

Until the mid-1980s, most USTs were made of bare steel, which is likely to corrode over time and allow UST contents to leak into the environment. Faulty installation or inadequate operating and maintenance procedures also can cause USTs to release their contents into the environment.

The greatest potential hazard from a leaking UST is that the petroleum or other hazardous substance can seep into the soil and contaminate groundwater, the source of drinking water for nearly half of all Americans. A leaking UST can present other health and environmental risks, including the potential for fire and explosion.

How have Congress and EPA responded to concerns about USTs?

In 1984, Congress responded to the increasing threat to groundwater posed by leaking USTs by adding Subtitle I to the Resource Conservation and Recovery Act (RCRA). Subtitle I required EPA to develop a comprehensive regulatory program for USTs storing petroleum or certain hazardous substances.

Congress directed EPA to publish regulations that would require owners and operators of new tanks and tanks already in the ground to prevent, detect, and clean up releases. At the same time, Congress banned the installation of unprotected steel tanks and piping beginning in 1985.

In 1986, Congress amended Subtitle I of RCRA and created the Leaking Underground Storage Tank Trust Fund, which is to be used for two purposes:

1. To oversee cleanups by responsible parties.
2. To pay for cleanups at sites where the owner or operator is unknown, unwilling, or unable to respond, or which require emergency action.

The 1986 amendments also established financial responsibility requirements. Congress directed EPA to publish regulations that would require UST owners and operators to demonstrate they are financially capable of cleaning up releases and compensating third parties for resulting damages.

Do all tanks have to meet federal EPA regulations?

The following USTs do not need to meet federal requirements for USTs:

- Farm and residential tanks of 1,100 gallons or less capacity holding motor fuel used for noncommercial purposes;
- Tanks storing heating oil used on the premises where it is stored;
- Tanks on or above the floor of underground areas, such as basements or tunnels;
- Septic tanks and systems for collecting storm water and wastewater;
- Flow-through process tanks;
- Tanks of 110 gallons or less capacity; and
- Emergency spill and overfill tanks.

Some state/local regulatory authorities, however, may include these tank types--be sure you check with these authorities.

What are the federal requirements for USTs?

In 1988, EPA issued UST regulations divided into three sections: technical requirements, financial responsibility requirements, and state program approval objectives (as described below).

Technical requirements for USTs

EPA's technical regulations for USTs are designed to reduce the chance of releases from USTs, detect leaks and spills when they do occur, and secure a prompt cleanup. UST owners and operators are responsible for reporting and cleaning up any releases. (See "Preventing Releases", "Detecting Releases", and "Cleaning Up Releases.") OUST produced a 36-page booklet called "Musts For USTs" that clearly presents the UST regulatory requirements.

Financial responsibility regulations for USTs

The financial responsibility regulations designed to ensure that, in the event of a leak or spill, an owner or operator will have the resources to pay for costs associated with cleaning up releases and compensating third parties. (See "Financial Responsibility.") OUST produced a 16-page booklet called "Dollars And Sense" that clearly presents these regulatory requirements.

State program approval objectives

EPA recognizes that, because of the large size and great diversity of the regulated community, state and local governments are in the best position to oversee USTs. Subtitle I of RCRA allows state UST programs approved by EPA to operate in lieu of the federal program, and EPA's state program approval regulations set standards for state programs to meet. (See "State Program Approval (SPA)" for more information.) States may have more stringent regulations than the federal requirements. If you are interested in requirements for USTs, contact your state UST program for information on state requirements.

R311-203-5. UST Testing Requirements.

(a) Tank tightness testing. The testing method must be able to test the UST system at the maximum level that could contain regulated substances. Tanks with overfill prevention devices that prevent product from entering the upper portion of the tank may be tested at the maximum level allowed by the overfill device.

(b) Automatic line leak detector testing. Line leak detectors shall be tested annually for functionality according to 40 CFR 280.44(a) and R311-200-1(b)(4). An equivalent test may be approved by the Executive Secretary. The test shall simulate a leak and provide a determination based on the test whether the leak detector functions properly and meets the requirements of 40 CFR 280.44(a). If a sump sensor is used as an automatic line leak detector, the sensor shall be located as close as is practical to the lowest portion of the sump.

(c) Containment sump testing. When a sump sensor is used as a leak detector, the secondary containment sump shall be tested for tightness annually according to the manufacturer's guidelines or standards, or by another method approved by the Executive Secretary.

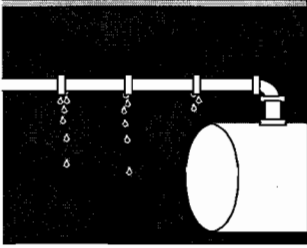
(d) Cathodic protection testing. Cathodic protection tests shall meet the inspection criteria outlined in 40 CFR 280.31(b)(2), or other criteria approved by the Executive Secretary. The tester who performs the test shall provide the following information: location of at least three test points per tank, test results in volts or millivolts, pass/fail determination for each tank, line, flex connector, or other UST system component tested, the criteria by which the pass/fail determination is made, and a site plat showing locations of test points. A re-test of any cathodic protection system is required within six months of any below-grade work that may harm the integrity of the system.

(e) UST testers performing tank and line tightness testing shall include the following as part of the test report: pass/fail determination for each tank or line tested, the measured leak rate, the test duration, the product level for tank tests, the pressure used for pressure tests, the type of test, and the test equipment used.

Line Tightness Testing (for piping only)	
Description Of Release Detection	This method uses a periodic line tightness test to determine if your piping is leaking. Tightness testing can be performed by either a trained professional or by using a permanently installed electronic system (sometimes connected to an automatic tank gauging system).
Have Certification For Your Release Detection Method	<ul style="list-style-type: none"> <input type="checkbox"/> Make sure your line tightness testing or permanently installed electronic system is certified for the types of piping and stored contents on which the release detection system is used. Most tightness test methods and release detection equipment have been tested and certified by a third party to verify that the equipment or services meet specific performance requirements set by regulatory agencies. If you don't have certified performance claims, have the tightness tester or equipment manufacturer provide them to you.
Perform These O&M Actions	<ul style="list-style-type: none"> <input type="checkbox"/> If line tightness testing is used for pressurized piping, the test must be conducted at least annually. <input type="checkbox"/> If line tightness testing is used for suction piping, the test must be conducted at least every three years. Safe suction piping as described at the bottom of page 3 may not need release detection testing. <input type="checkbox"/> This tightness testing must be conducted by a professional trained in performing line tightness testing or by using a permanently installed electronic system. <input type="checkbox"/> See Section 3 of this manual if your piping fails the tightness test or if the electronic system indicates a leak. <input type="checkbox"/> Periodically have a qualified UST contractor, such as the vendor who installed your release detection system, service all the system components according to the manufacturers' service instructions. Components can wear out and must be checked periodically. Many vendors recommend or require this maintenance activity at least annually. <input type="checkbox"/> Make sure employees who run, monitor, or maintain the release detection system know exactly what they have to do and to whom to report problems. Develop and maintain regular training programs for all employees.
Keep These O&M Records	<ul style="list-style-type: none"> <input type="checkbox"/> Keep results of your release detection system tests for at least 1 year. Your monitoring equipment may provide printouts that can be used as records. Unless you are recording actual release detection results at least every 30 days and maintaining records for at least 1 year, you are not doing leak detection right. <input type="checkbox"/> If you use a permanently installed electronic system, keep all records of calibration, maintenance, and repair of your equipment for at least 1 year. <input type="checkbox"/> Keep all performance claims supplied by the installer, vendor, or manufacturer for at least 5 years. These records include the certification of your leak detection equipment described above.

Leak Detection For Underground Piping

Will you be in compliance?



When installed and operated according to the manufacturer's specifications, the leak detection methods discussed here meet the federal regulatory requirements for the life of underground piping systems. Your UST may have **suction** or **pressurized** piping, which are discussed below.

What are the regulatory requirements for suction piping?

- No leak detection is required if the suction piping has (1) enough slope so that the product in the pipe can drain back into the tank when suction is released and (2) has only one check valve, which is as close as possible beneath the pump in the dispensing unit. If a suction line is to be considered exempt based on these design elements, there must be some way to check that the line was actually installed according to these plans.
- If a suction line does not meet all of the design criteria noted above, one of the following leak detection methods must be used:
 - ▶ A line tightness test at least every 3 years; or
 - ▶ Monthly interstitial monitoring; or
 - ▶ Monthly vapor monitoring (including tracer compound analysis); or
 - ▶ Monthly groundwater monitoring; or
 - ▶ Monthly statistical inventory reconciliation; or
 - ▶ Other monthly monitoring that meets performance standards.

The line tightness test must be able to detect a leak at least as small as 0.1 gallon per hour at 1.5 times normal operating pressure with certain probabilities of detection and of false alarm.

Interstitial monitoring, vapor monitoring (including tracer compound analysis), groundwater monitoring, and statistical inventory reconciliation have the same regulatory requirements for piping as they do for tanks. See the earlier sections of this booklet on those methods.

What are the regulatory requirements for pressurized piping?

Each pressurized piping run must have one leak detection method from each set below:

An automatic line leak detector:

- ▶ Automatic flow restrictor; or
- ▶ Automatic flow shutoff; or
- ▶ Continuous alarm system.

And one other method:

- ▶ Annual line tightness test; or
 - ▶ Monthly interstitial monitoring; or
 - ▶ Monthly vapor monitoring (including tracer compound analysis); or
 - ▶ Monthly groundwater monitoring; or
 - ▶ Monthly statistical inventory reconciliation; or
 - ▶ Other monthly monitoring that meets performance standards.
- The automatic line leak detector (LLD) must be designed to detect a leak at least as small as 3 gallons per hour at a line pressure of 10 pounds per square inch within 1 hour by shutting off the product flow, restricting the product flow, or triggering an audible or visual alarm.
 - The line tightness test must be able to detect a leak at least as small as 0.1 gallon per hour when the line pressure is 1.5 times its normal operating pressure. The test must be conducted each year. If the test is performed at pressures lower than 1.5 times operating pressure, the leak rate to be detected must be correspondingly lower.
 - Automatic LLDs and line tightness tests must also be able to meet the federal regulatory requirements regarding probabilities of detection and false alarm.
 - Interstitial monitoring, vapor monitoring (including tracer compound analysis), groundwater monitoring, and statistical inventory reconciliation have the same regulatory requirements for piping as they do for tanks. See the earlier sections of this booklet on those methods.

Find out if there are state or local requirements on the use of leak detection methods for piping that differ from those described here.

How do the leak detection methods work?

Automatic line leak detectors (LLDs)

- Flow restrictors and flow shutoffs can monitor the pressure within the line in a variety of ways: whether the pressure decreases over time; how long it takes for a line to reach operating pressure; and combinations of increases and decreases in pressure.

- If a suspected leak is detected, a *flow restrictor* keeps the product flow through the line well below the usual flow rate. If a suspected leak is detected, a *flow shutoff* completely cuts off product flow in the line or shuts down the pump.
- A *continuous alarm system* constantly monitors line conditions and immediately triggers an audible or visual alarm if a leak is suspected. Automated internal, vapor, or interstitial line monitoring systems can also be set up to operate continuously and sound an alarm, flash a signal on the console, or even ring a telephone in a manager's office when a leak is suspected.
- Both automatic flow restrictors and shutoffs are permanently installed directly into the pipe or the pump housing.
- Vapor, interstitial, or other monitoring systems can be installed to shut off flow, restrict flow, or trigger an alarm whenever a leak is detected. If it meets the applicable standards, such a setup meets the monthly monitoring requirement as well as the LLD requirement.

Line tightness testing

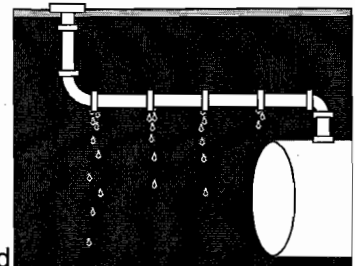
- The line is taken out of service and pressurized, usually above the normal operating pressure. A drop in pressure over time, usually an hour or more, suggests a possible leak.
- Suction lines are not pressurized very much during a tightness test (about 7 to 15 pounds per square inch).
- Most line tightness tests are performed by a testing company. You just observe the test.
- Some *tank* tightness test methods can be performed to include a tightness test of the connected piping.
- For most line tightness tests, no permanent equipment is installed.
- In the event of trapped vapor pockets, it may not be possible to conduct a valid line tightness test. There is no way to tell definitely before the test begins if this will be a problem, but long complicated piping runs with many risers and dead ends are more likely to have vapor pockets.
- Some permanently installed electronic systems (which often include ATGS) can meet the requirements of monthly monitoring or a line tightness test.

Secondary containment with interstitial monitoring

- A barrier is placed between the piping and the environment. Double-walled piping or a leakproof liner in the piping trench can be used.
- A monitor is placed between the piping and the barrier to sense a leak if it occurs. Monitors range from a simple stick that can be put in a sump to see if a liquid is present, to continuous automated systems that monitor for the presence of liquid product or vapors.
- Proper installation of secondary containment is the most important and the most difficult aspect of this leak detection method. Trained and experienced installers are necessary.
- See the section on secondary containment for additional information. Secondary containment for piping is similar to that for tanks.

Vapor (including tracer compound analysis) or groundwater monitoring

- Vapor monitoring detects product that leaks into the soil and evaporates.
- Tracer compound analysis uses a tracer chemical to determine if there is a hole in the line.
- Groundwater monitoring checks for leaked product floating on the groundwater near the piping.
- A site assessment must be used to determine monitoring well placement and spacing.
- UST systems using vapor (including tracer compound analysis) or groundwater monitoring for the tanks are well suited to use the same monitoring method for the piping.
- See the earlier sections on vapor (including tracer compound analysis) and groundwater monitoring. Use of these methods with piping is similar to that for tanks.





THE UTAH PETROLEUM STORAGE TANK FUND

UST testers should be prepared to answer questions from owners or operators concerning the PST **Fund**.

CERTIFICATE OF COMPLIANCE

A Utah Certificate of Compliance is required for USTs receiving petroleum products. However, in order to receive a Certificate of Compliance it is necessary to have the UST tightness tested. This is a paradox for tightness tests which require fuel in the UST. To resolve this, the **DERR** issues a "*One time fuel drop letter*" (sample included) for the purpose of receiving fuel for the tank tightness test.

USTs which have a valid Certificate of Compliance when a release occurs are covered for up to \$1,000,000 for environmental cleanup from the Utah Petroleum Storage Tank (PST) Fund. Participation in the PST Fund is **required** at all facilities beginning July 1, 1991. Any UST without a Certificate of Compliance is in compliance with Utah law, and therefore, subject to penalties (See Section **R311-208**).

If petroleum is placed into an UST without a Certificate of Compliance (or one time fuel drop letter), owners, operators, and distributors are subject up to a \$500 penalty per occurrence.

_____ Date _____

RE: UNDERGROUND STORAGE TANKS LOCATED AT _____, UTAH; FACILITY ID #: _____

Dear M:

According to the provisions of the Utah Underground Storage Tank Act (Act), Utah Code Annotated (UCA), Section 19-6-412, all owners and operators of petroleum underground storage tanks must have a Certificate of Compliance by July 1, 1991. Any petroleum distributor who delivers to a tank that does not have a Certificate of Compliance will be subject to a civil penalty of \$500 per occurrence (19-6-416, UCA).

The Division of Environmental Response and Remediation (DERR) has received your request to receive one delivery of fuel to test your tanks at the above referenced facility. This letter is NOT a Certificate of Compliance but allows you to obtain petroleum products for testing your tanks.

This letter applies to fuel being delivered from _____ on _____. A Certificate of Compliance cannot be issued for the non-complying tanks. If after our review, your tanks are found not to be in substantial compliance with federal and state rules and regulations, a certificate cannot be issued.

If you require further assistance, please contact _____ at (801) 536-4100.

Sincerely,

Kent P. Gray, Executive Secretary (UST)
Solid and Hazardous Waste Control Board

KPG/DEM/

cc: _____ Health Department
_____ DEQ Engineer

Obtaining a Certificate of Compliance

WHAT IS REQUIRED?

The Utah Underground Storage Tank (UST) Act requires that owners and operators of regulated petroleum USTs qualify their tanks for and receive a Certificate of Compliance, and keep the tanks in substantial compliance with all UST rules and regulations. It is a violation of the UST Act to operate these USTs without a certificate. New tanks must have a certificate before being put into operation. Fines may be assessed if product or other regulated substance is delivered to or placed into an UST that does not have a Certificate of Compliance. (Certificate of Compliance Packet - pdf)

HOW DO I GET A CERTIFICATE?

To qualify for and receive a Certificate of Compliance, complete the following steps:

- Submit a completed Application for Certificate of Compliance and declare whether you will participate in the Utah Petroleum Storage Tank Trust Fund (PST Fund) or demonstrate financial responsibility for your USTs by another allowable mechanism. You must meet all requirements for coverage under your chosen mechanism before you operate the USTs.
- Pay the Registration Fee of \$100 per tank for USTs participating in the PST Fund, or \$200 per tank for USTs using another allowable financial responsibility mechanism.
- Conduct a tank and line tightness test and submit a complete copy of the results (including field notes, measured leak rate, and other technical data). The tightness tests must be performed by a Utah certified UST Tester. To receive fuel for the test, you must contact the Division of Environmental Response and Remediation (DERR) at (801) 536-4100 for authorization of a one-time delivery. The DERR will need to know the date of delivery and the name of the company that will deliver the fuel.
- Submit a completed Previous Pollution Incidents form to indicate whether you have had any petroleum releases at the facility. If you participate in the PST Fund, failure to report previous releases could void your coverage. Payment of clean-up costs for previous releases is your responsibility.
- Submit a facility site plat or as-built drawing that shows the tank excavation, buildings, tanks, product lines, vent lines, cathodic protection systems, tank leak detection systems and product line leak detection systems. The site plat is required under Section R311-203-3(e) of the Utah UST rules.

If you choose to participate in the PST Fund you must:

- Check the box on the Application for Certificate of Compliance to indicate participation in the PST Fund and indicate the financial responsibility mechanism you will use to pay the cleanup costs not covered by the Fund.
- Pay the PST Fund fee. Pay \$50 per tank for USTs installed at new facilities. If a new UST is installed at a facility with existing USTs, pay the rate assessed to the existing USTs for the current fiscal year, either \$50 or \$150 per tank. If the new UST is a replacement for a previously-existing UST, the current year PST Fund fee paid for the original tank is applied to the new UST.

If you choose to demonstrate financial responsibility by another mechanism you must:

Submit documentation for the mechanism you will use. The documents must conform to the format and wording specified in 40 CFR 280 subpart H. The state UST rules (R311-206-5) have additional requirements. The mechanism must be approved by the DERR before the Certificate of Compliance can be issued. The documentation should be submitted several weeks in advance of the time the tanks will go into service to allow for the approval process. If the mechanism has already been approved for other tanks, submit an updated list of tanks covered by the mechanism to show the new ones.

Pay the process fee of \$420 for the mechanism to be used. If the mechanism has already been approved for other tanks, no process fee is due if the fee for the current year has already been paid.

For additional information on financial responsibility, please refer to Demonstrating Financial Responsibility.

Submit the forms and other required information to:

Division of Environmental Response and Remediation
168 North 1950 West
PO Box 144840
Salt Lake City, Utah 84114-4840

If you have questions, please contact the DERR UST Section at (801) 536-4100. Forms and additional information are available on the Utah DERR web site at www.undergroundtanks.utah.gov.

Obtaining a Certificate of Compliance

WHAT IS REQUIRED?

The Utah Underground Storage Tank (UST) Act requires that owners and operators of regulated petroleum USTs qualify their tanks for and receive a Certificate of Compliance, and keep the tanks in substantial compliance with all UST rules and regulations. It is a violation of the UST Act to operate these USTs without a certificate. New tanks must have a certificate before being put into operation. Fines may be assessed if product or other regulated substance is delivered to or placed into an UST that does not have a Certificate of Compliance.

HOW DO I GET A CERTIFICATE?

To qualify for and receive a Certificate of Compliance, complete the following steps:

1. Register the USTs using *Notification for Underground Storage Tanks*, EPA Form 7530-1. The tank owner and the certified installer must sign the form to certify a proper installation.

2. Submit a completed *Application for Certificate of Compliance* and declare whether you will participate in the Utah Petroleum Storage Tank Trust Fund (PST Fund) or demonstrate financial responsibility for your USTs by another allowable mechanism. You must meet all requirements for coverage under your chosen mechanism before you operate the USTs.

3. Pay the Registration Fee of \$100 per tank for USTs participating in the PST Fund, or \$200 per tank for USTs using another allowable financial responsibility mechanism.

4. Conduct a tank and line tightness test and submit a complete copy of the results (including field notes, measured leak rate, and other technical data). The tightness tests must be performed by a Utah certified UST Tester. To receive fuel for the test, you must contact the Division of Environmental Response and Remediation (DERR) at (801) 536-4100 for authorization of a one-time delivery. The DERR will need to know the date of delivery and the name of the company that will deliver the fuel.

5. Submit a completed *Previous Pollution Incidents* form to indicate whether you have had any petroleum releases at the facility. If you participate in the PST Fund, failure to report previous releases could void your coverage. Payment of clean-up costs for previous releases is your responsibility.

6. Submit a facility site plat or as-built drawing that shows the tank excavation, buildings, tanks, product lines, vent lines, cathodic protection systems, tank leak detection systems and product line leak detection systems. The site plat is required under Section R311-203-3(e) of the Utah UST rules.

If you choose to participate in the PST Fund you must:

- Check the box on the *Application for Certificate of Compliance* to indicate participation in the PST Fund and indicate the financial responsibility mechanism you will use to pay the cleanup costs not covered by the Fund.
- Pay the PST Fund fee. Pay \$50 per tank for USTs installed at new facilities. If a new UST is installed at a facility with existing USTs, pay the rate assessed to the existing USTs for the current fiscal year, either \$50 or \$150 per tank. If the new UST is a replacement for a previously-existing UST, the current year PST Fund fee paid for the original tank is applied to the new UST.

If you choose to demonstrate financial responsibility by another mechanism you must:

- Submit documentation for the mechanism you will use. The documents must conform to the format and wording specified in 40 CFR 280 subpart H. The state UST rules (R311-206-5) have additional requirements. The mechanism must be approved by the DERR before the Certificate of Compliance can be issued. The documentation should be submitted several weeks in advance of the time the tanks will go into service to allow for the approval process. If the mechanism has already been approved for other tanks, submit an updated list of tanks covered by the mechanism to show the new ones.
- Pay the process fee of \$420 for the mechanism to be used. If the mechanism has already been approved for other tanks, no process fee is due if the fee for the current year has already been paid.

For additional information on financial responsibility, please refer to *Demonstrating Financial Responsibility* on the following page.

Submit the forms and other required information to:

Division of Environmental Response and Remediation
168 North 1950 West
PO Box 144840
Salt Lake City, Utah 84114-4840

If you have questions, please contact the DERR UST Section at (801) 536-4100. Forms and additional information are available on the Utah DERR web site at www.undergroundtanks.utah.gov.

Demonstrating Financial Responsibility

WHAT IS FINANCIAL RESPONSIBILITY?

State and Federal underground storage tank (UST) regulations require that owners and operators of regulated petroleum USTs demonstrate financial responsibility to show they can pay the costs of cleanups and third-party claims for leaks from USTs.

The amount of financial responsibility you must have depends on the type of business you operate, the yearly throughput of each facility, and the number of tanks you own. The following table shows the amounts required:

WHO	THROUGHPUT OF FACILITY	PER OCCURRENCE COVERAGE REQUIRED	AGGREGATE COVERAGE REQUIRED
PETROLEUM MARKETER	ANY THROUGHPUT	\$1,000,000	\$1,000,000 IF YOU OWN 100 OR FEWER TANKS
PETROLEUM NON-MARKETER	10,000 GALLONS OR LESS MONTHLY	\$500,000	
PETROLEUM NON-MARKETER	MORE THAN 10,000 GALLONS MONTHLY	\$1,000,000	OR \$2,000,000 IF YOU OWN MORE THAN 100 TANKS

- Marketing facilities (service stations, truck stops, etc.) must have \$1 million of "per occurrence" coverage. This is the amount that must be available to pay the costs of one petroleum release. Non-marketing facilities must have the same amount of per occurrence coverage unless they have a monthly throughput of 10,000 gallons or less. In this case, the per occurrence coverage amount is \$500,000.
- UST owner/operators must also have coverage for an annual aggregate amount. This is the amount that you must have to cover all leaks that might occur in one year. The amount of aggregate coverage depends on the number of tanks you have: \$1 million if you have 100 or fewer tanks, \$2 million if you have more than 100 tanks.

HOW TO SHOW FINANCIAL RESPONSIBILITY

Owner/operators of regulated petroleum USTs in Utah may show financial responsibility by participating in the Utah Petroleum Storage Tank Trust Fund (PST Fund) or by using one of the other mechanisms allowed by the Federal UST regulations (40 CFR 280, subpart H).

Demonstrating financial responsibility is one requirement for receiving a Certificate of Compliance. If you use a mechanism other than the PST Fund, you must meet all requirements for the mechanism before you receive a certificate.

Petroleum Storage Tank Trust Fund

The PST Fund pays most of the cleanup costs of covered releases up to the limits set by the federal UST regulations. The responsible party pays the first \$10,000 (in some cases \$25,000) of eligible cleanup costs and the Fund pays the remaining eligible costs up to the limits set by the Federal regulations. Any costs over these limits must be paid by the responsible party.

UST owner/operators who participate in the Fund pay an annual Petroleum Storage Tank Fund fee based on the yearly throughput for each facility and a per-gallon surcharge on petroleum products sold in the state.

Other Financial Responsibility Mechanisms

For those who do not participate in the Fund, the Federal UST regulations allow several options for demonstrating financial responsibility. Each one is described in detail in 40 CFR 280, subpart H. The state UST rules (R311-206-5) have additional requirements. Some of the allowed mechanisms are:

Self-insurance. If your firm has a tangible net worth of at least \$10 million, you can show financial responsibility by passing one of two financial tests.

Insurance coverage. Insurance may be available from a private insurer or a risk retention group.

Guarantee. You may secure a guarantee for the coverage amount from another firm with whom you have a substantial business relationship. The provider of the guarantee must pass a financial test.

Letter of credit. A letter of credit is a contract involving you, an issuer (usually a bank), and a third party (such as the implementing agency) that obligates the issuer to help you demonstrate your financial responsibility.

Trust fund. You may set up a fully-funded trust fund administered by a third party to show financial responsibility.

If you show financial responsibility by one of the allowable alternative mechanisms, you must pay a yearly processing fee and submit documentation of your mechanism each year.

The mechanism you choose must cover costs of both corrective action and third-party liability, and must provide coverage up to the Federal limits.

Keep In Mind:

- If you use another financial responsibility mechanism, then later decide to participate in the PST Fund, you will be required to perform a tank and line tightness test and a site assessment (including soil and/or groundwater samples) before the tanks can participate in the PST Fund, as specified in the Utah UST Act, UCA 19-6-428.
- If you choose to participate in the PST Fund, all tanks located at the same facility, including above-ground tanks and unregulated USTs, may be required to participate.

If you have questions, please contact the DERR UST Section at (801) 536-4100. Forms and additional information are available on the Utah DERR web site at www.undergroundtanks.utah.gov.

**Utah UST Program
Previous Pollution Incidents**

Facility ID _____

This letter, or an equivalent, must be signed and submitted as a requirement for receiving a Certificate of Compliance.

To: Mr. Brad T Johnson
Executive Secretary (UST)
Utah Solid & Hazardous Waste Control Board

Dear Mr. Johnson:

As required by paragraph 19-6-413 of the Utah Underground Storage Tank Act, I have performed a tank and line tightness test on each tank at my facility. Based on this test, there has not been a release of petroleum. Additionally, based on "customary business inventory practices standards" I am not aware of any release of petroleum from my tanks.

Signature of owner/operator

Or, if a release is known to have occurred at this facility:

I have had the following releases of petroleum (detailed below; also indicate the actions you have taken to clean up the release):

Signature of owner/operator

Failure to report previous releases could invalidate your Certificate of Compliance.

**Utah UST Program
Application for Certificate of Compliance**

Facility ID# _____

UST Owner Information

UST Facility Information

Owner Name:			Facility Name:		
Address:			Address:		
City:	State:	Zip:	City:	State: UT	Zip:
Contact:		Phone:	Contact:		Phone:

DESCRIPTION OF UNDERGROUND STORAGE TANKS

Tank #					
Date Installed					
Capacity					
Substance Stored					

TANK/LINE TIGHTNESS TEST Indicate Pass or Fail for each tank and product line tested. Include copy of test.

Tank #					
Tank Test					
Line Test					

TYPE OF FACILITY

- Marketing facility, or non-marketer with facility average monthly throughput greater than 10,000 gallons.
- Non-marketer with facility average monthly throughput less than 10,000 gallons.

COMPLIANCE WITH UST REGULATIONS

- All Underground Storage Tanks (USTs) at this facility have been registered.
- All UST registration fees and Petroleum Storage Tank Fund Fees have been paid.

Are your USTs currently in compliance with all Federal, State, and Local UST regulations?

- Yes No If "No" describe items of non-compliance:

PREVIOUS POLLUTION INCIDENTS

- Complete the Previous Pollution Incidents form to indicate whether a pollution incident has occurred at the facility.

FINANCIAL RESPONSIBILITY MECHANISM DECLARATION (check one only)

I choose to participate in the Petroleum Storage Tank (PST) Trust Fund.

- Indicate the number of above-ground and non-regulated underground tanks at the facility: _____
- Indicate the financial responsibility mechanism to be used for cleanup costs not covered by the Fund. _____

Above-ground tanks and non-regulated USTs at the facility may be required to participate in the Fund.

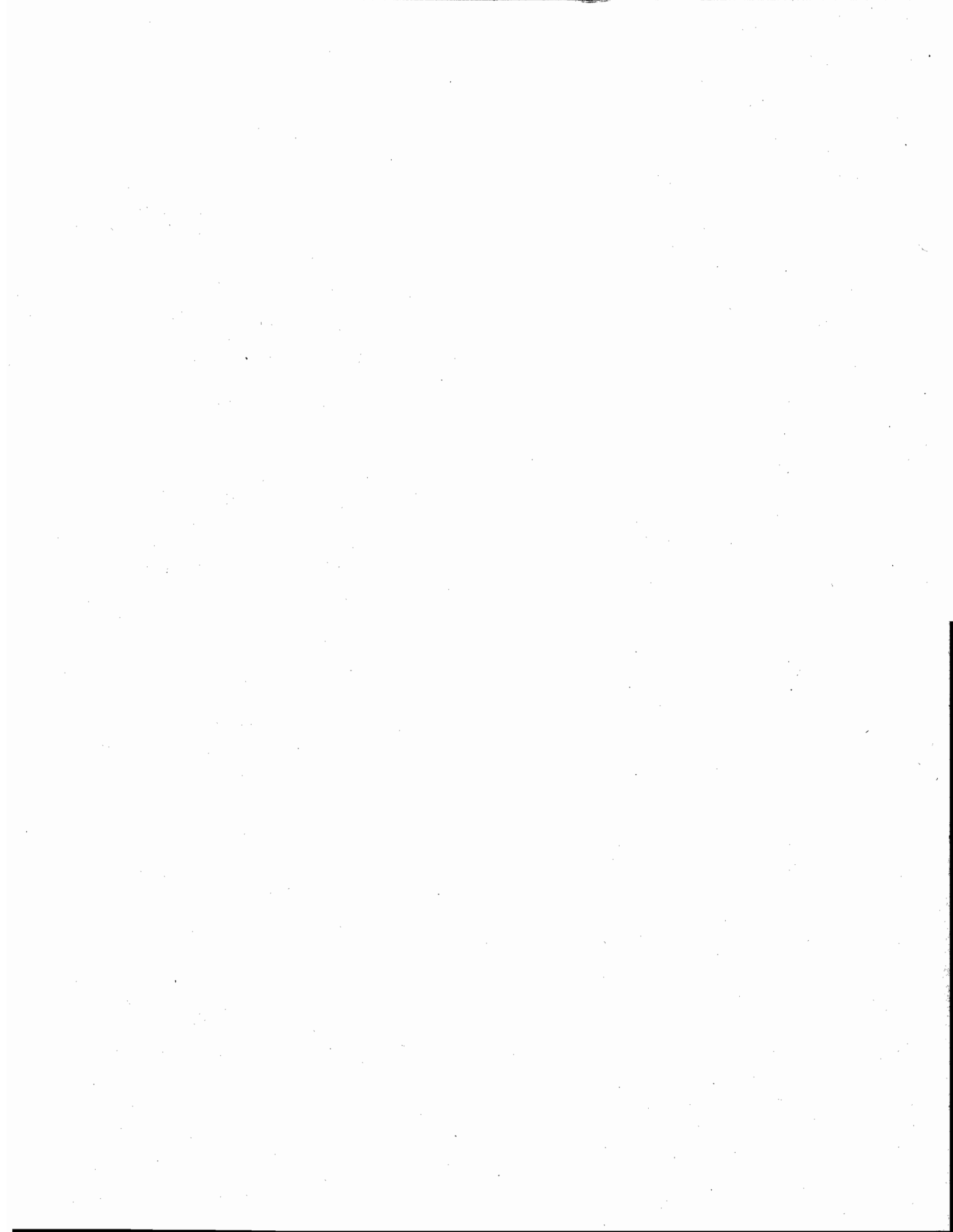
I choose another Financial Responsibility mechanism for the USTs at this facility.

- Indicate the financial responsibility mechanism to be used: _____
- (For self-insurance or guarantee) Indicate your company's fiscal year end date: _____
- (For Insurance) Indicate the date the policy is renewed each year: _____

The Certificate of Compliance cannot be issued until all documents have been submitted and the mechanism has been approved. If the mechanism has already been approved for other tanks, submit an amended list of covered tanks.

I certify under penalty of law that the above representations made by me are true and correct.

Owner/operator Signature _____ Date Signed _____



UST SAFETY

Nothing is more important than safety on the job site!!! Safety of the work crew should be the primary concern for UST Testers.

MONITORING EQUIPMENT

The use of environmental monitoring equipment is essential to safety at UST sites. Many UST accidents could have been prevented if UST testers were trained and accurately used environmental monitoring equipment.

Review: **Health and Safety Training (EPA).**

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

EMERGENCY OVERVIEW

DANGER!

**EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT
- EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF
SWALLOWED - ASPIRATION HAZARD**



NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION (rev. Jan-04)

Amerada Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs):

CHEMTREC (800)424-9300

COMPANY CONTACT (business hours):

Corporate Safety (732)750-6000

MSDS Internet Website

www.hess.com/about/envIRON.html

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS * (rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

3. HAZARDS IDENTIFICATION (rev. Dec-97)

EYES

Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY

Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES (rev. Dec-97)

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION

Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

5. FIRE FIGHTING MEASURES (rev. Dec-97)

FLAMMABLE PROPERTIES:

FLASH POINT: -45 °F (-43°C)
AUTOIGNITION TEMPERATURE: highly variable; > 530 °F (>280 °C)
OSHA/NFPA FLAMMABILITY CLASS: 1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%): 1.4%
UPPER EXPLOSIVE LIMIT (%): 7.6%

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO₂, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 "Low Expansion Foam - 1994 Edition."

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES (rev. Dec-97)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE (rev. Dec-97)

HANDLING PRECAUTIONS

*****USE ONLY AS A MOTOR FUEL*****

*****DO NOT SIPHON BY MOUTH*****

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04)

EXPOSURE LIMITS

Component (CAS No.)	Source	Exposure Limits		Note
		TWA (ppm)	STEL (ppm)	
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	800	--	2003 NOIC: 1000 ppm (TWA) Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits	Note
n-Hexane (110-54-3)	OSHA	500	--		
	ACGIH	50	--	skin	
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50	--	A3	
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established	
Toluene (108-88-3)	OSHA	200	--	Ceiling: 300 ppm; Peak: 500 ppm (10 min.)	
	ACGIH	50	--	A4 (skin)	
1,2,4-Trimethylbenzene (95-63-6)	ACGIH	25	--		
Xylene, mixed isomers (1330-20-7)	OSHA	100	--		
	ACGIH	100	150	A4	

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of E.I. DuPont Tychem®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES (rev. Jan-04)

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	<u>Odor Detection</u>	<u>Odor Recognition</u>
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 °F (39 to 200 °C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C))
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H ₂ O = 1):	0.70 - 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

SOLUBILITY (H₂O): Non-oxygenated gasoline - negligible (< 0.1% @ 77 °F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 °F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY (rev. Dec-94)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES (rev. Dec-97)

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg

Acute Oral LD50 (rat): 18.75 ml/kg

Primary dermal irritation (rabbits): slightly irritating

Draize eye irritation (rabbits): non-irritating

Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity: OSHA: NO IARC: YES - 2B

NTP: NO

ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION (rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS (rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

14. TRANSPORTATION INFORMATION (rev. Jan-04)

DOT PROPER SHIPPING NAME: Gasoline
DOT HAZARD CLASS and PACKING GROUP: 3, PG II
DOT IDENTIFICATION NUMBER: UN 1203
DOT SHIPPING LABEL: FLAMMABLE LIQUID

PLACARD:



15. REGULATORY INFORMATION (rev. Jan-04)

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

<u>ACUTE HEALTH</u>	<u>CHRONIC HEALTH</u>	<u>FIRE</u>	<u>SUDDEN RELEASE OF PRESSURE</u>	<u>REACTIVE</u>
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

<u>INGREDIENT NAME (CAS NUMBER)</u>	<u>CONCENTRATION WT. PERCENT</u>
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

<u>INGREDIENT NAME (CAS NUMBER)</u>	<u>CONCENTRATION - Parts per million (ppm) by weight</u>
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)

Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION (rev. Jan-04)

NFPA® HAZARD RATING HEALTH: 1 Slight
FIRE: 3 Serious
REACTIVITY: 0 Minimal

HMIS® HAZARD RATING HEALTH: 1 * Slight
FIRE: 3 Serious
REACTIVITY: 0 Minimal
* CHRONIC

SUPERSEDES MSDS DATED: 12/30/97

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
AIHA	American Industrial Hygiene Association	OPA	Oil Pollution Act of 1990
ANSI	American National Standards Institute (212)642-4900	OSHA	U.S. Occupational Safety & Health Administration
API	American Petroleum Institute (202)682-8000	PEL	Permissible Exposure Limit (OSHA)
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act	RCRA	Resource Conservation and Recovery Act
DOT	U.S. Department of Transportation [General Info: (800)467-4922]	REL	Recommended Exposure Limit (NIOSH)
EPA	U.S. Environmental Protection Agency	SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
HMIS	Hazardous Materials Information System	SCBA	Self-Contained Breathing Apparatus
IARC	International Agency For Research On Cancer	SPCC	Spill Prevention, Control, and Countermeasures
MSHA	Mine Safety and Health Administration	STEL	Short-Term Exposure Limit (generally 15 minutes)
NFPA	National Fire Protection Association (617)770-3000	TLV	Threshold Limit Value (ACGIH)
NIOSH	National Institute of Occupational Safety and Health	TSCA	Toxic Substances Control Act
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)	TWA	Time Weighted Average (8 hr.)
		WEEL	Workplace Environmental Exposure Level (AIHA)
		WHMIS	Workplace Hazardous Materials Information System (Canada)

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

United States
Environmental Protection
Agency

Solid Waste and
Emergency Response
(OS-420)WF

EPA/910/B-92/001
June 1992



Health and Safety Training for Underground Storage Tank Inspectors



FIRES AND EXPLOSIONS

EXHIBIT 2-1

ACCIDENTS INVOLVING HANDLING AND TRANSFER OF PETROLEUM PRODUCTS

Some reported accidents involving the Handling and Transfer of Petroleum Products are presented below. Notice that a large number of accidents occur during closure.

Explosion in Tank "Deemed Safe" Kills One

Georgia, 1990 - A Snellville, Georgia man dies April 17 when a 10,000-gallon underground gasoline storage tank explodes at Dry Storage of Georgia. The tank was deemed safe one-half hour before the explosion occurred. The worker was a five-year employee of Westinghouse Environmental and Geotechnical Services, a company that specializes in removing underground tanks. This is the third death in Georgia in less than a year involving a tank closure.

Worker Dies in "Preventable" Accident

Tulsa, 1990 - An underground storage tank explosion kills a worker and blows out the windows in nearby stores. The explosion occurs when two workers are attempting to cut a fill pipe from an UST containing a small amount of water and some residual fuel. The metal cutting saw they are using creates a spark that ignites the gasoline vapors. The ensuing blast blows the 5-foot end off the tank. The flying metal disk travels 20 feet and decapitates a co-worker who is returning to the job site from a convenience store located across the street. A Tulsa Fire Department spokesman characterizes the incident as "a highly preventable accident."

Worker Dies from Trauma Following Explosion

Tulsa, 1990 - An explosion in an empty gasoline storage tank kills a worker as he is dismantling it with an acetylene torch. According to authorities, the steel tank was removed from the ground the week prior to the explosion and a substance was placed in it to help ventilate fumes. The plumbing company returned to begin dismantling the tank, assuming it to be free of fumes. The 2,000-gallon steel tank explodes when the worker, employed by the plumbing contractor, applies an acetylene torch to it. The end of the tank blows out and propels the worker backwards about 25 feet, where he hits a building. The man dies, apparently from trauma suffered when thrown by the explosion. In addition, a building on the property and a truck owned by the plumbing contractor are damaged.

Explosion Crushes Worker

Indianapolis, 1990 - Employees of a company which collects empty fuel tanks and cuts them up into scrap metal are in the midst of purging vapors and cutting tanks when the accident occurs. A worker is using an acetylene torch to cut a tank when an adjacent tank explodes, pushing it 6 feet forward into the one he is working on. The worker is crushed between the tank he is working on and a wrecker parked nearby. Investigators suspect that the tank that exploded either had not yet been cleaned or had been cleaned improperly.

EXHIBIT 2-1 (con.)

ACCIDENTS INVOLVING HANDLING AND TRANSFER OF PETROLEUM PRODUCTS

Man Killed While "Scraping" Abandoned Underground Storage Tank

A scrap metal and metal dealer is working alone and using an acetylene torch to cut a tank into scrap when the flame from the torch ignites fumes inside the tank and touches off an explosion. The force of the blast lifts the 10,000-gallon tank into the air, sending it about 50 feet from its initial spot. A tank end is blown about 450 feet into a nearby field.

The tank, measuring 20 feet by 10 feet, was reportedly used for underground storage of residential heating oil. However, individuals at the accident scene speculated the tank actually contained gasoline or gasoline residue, and that fumes from the gasoline ignited. The victim's brother said the worker was experienced in cutting scrap metal and "knew better than to cut up a gas tank."

OHIO - Sandblasting Incident

A man retained to sandblast an underground storage tank dies when he turns on an electric vacuum cleaner as he prepares to clean sand from the tank bottom. A spark from the vacuum cleaner ignites the vapors inside the tank, causing it to explode. He dies later as a result of the burns suffered in the blast.

Tank Abandonment Kills Three

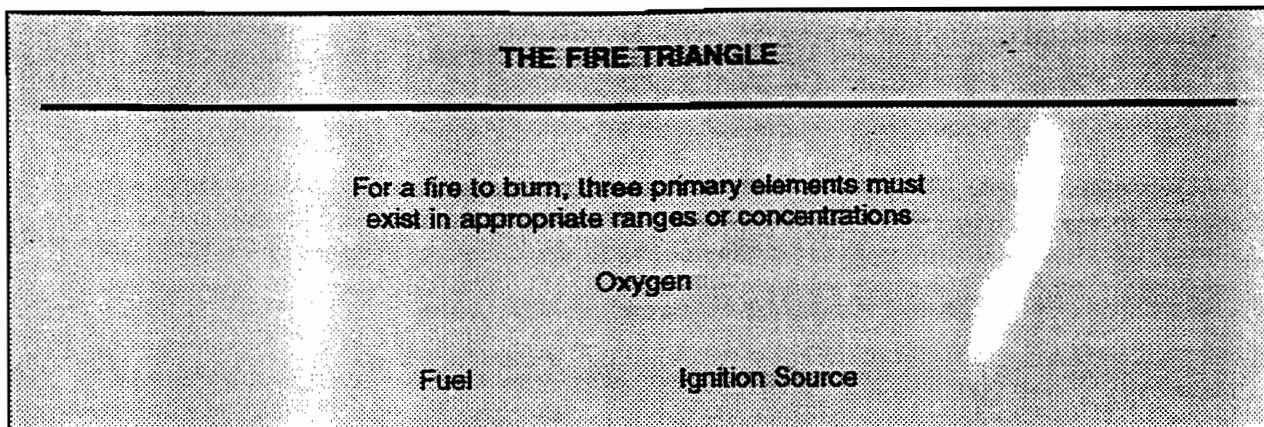
While cutting the top off an empty tank at Kerr-McGee's Cotton Valley Refinery, a piece of equipment apparently ignites vapors inside the tank. The blast kills three men inside the tank; a fourth man left the tank to get some tools and escaped unharmed.

Explosion Narrowly Avoided

1990 - Two employees breaking out the concrete inside a pump island in order to relocate the product line, instead of capping the exposed line, stuff a rag in it to keep the dirt and broken concrete out. While cleaning the island with shovels, a spark ignites the fumes coming through the rag. The rag immediately catches fire and burns until the employees smother it with dirt.

Tank Worker Dies During Vapor Check

1990 - An Oregon tank worker places a lighted rag down a fill pipe to determine if the tank contains vapors. It does, and an explosion results, killing the worker.



THE FIRE TRIANGLE

Fire is a rapid and persistent chemical reaction accompanied by the emission of heat and light. Three primary elements, represented by the fire triangle, must be present for a fire to burn: **oxygen, fuel, and a source of ignition.**

Each side of the fire triangle represents one of the necessary elements of fire. The center of the triangle represents the optimal fuel-to-oxygen ratio with enough heat to ignite the mixture. If any of the elements are removed, however, there can be no fire (this is represented by the corners of the triangle). For example, if the wood on a campfire is consumed or removed, the fuel supply is no longer sufficient to sustain combustion.

A more modern fire triangle would have these three elements: oxidizer, fuel, and energy source. Energy can be produced by chemical reaction, mechanical action or electrical discharge. All these factors may come into play at UST sites.

It is important to understand that it is not the liquid which burns. Vapors are produced, which are heated and broken into simpler compounds (such as methane) which will readily oxidize. The flame above a solid material is also the result of the burning of heated gases. Surface burning may occur after all the volatile materials are driven off, as in the case of burning charcoal. Surface burning also occurs when metals burn.

Once started, a fire will continue until the fuel or oxygen concentration falls below a minimum value. A fire commonly results from the combination of some combustible material with oxygen, but the oxidizer does not have to be O₂. The oxygen may be part of a chemical compound such as nitric acid or ammonium perchlorate. Combustion may also occur, in some cases, without oxygen being involved; for example, break fluid can be ignited by chlorine.

Oxidation can occur with any chemical material that can easily yield oxygen, or a similar element. Similar compounds include fluorine, chlorine, and bromine. However, simply because a compound contains these elements does not make it a strong oxidizer. Carbon dioxide has two oxygens, but is not an oxidizer.

FACTORS IMPORTANT IN COMBUSTION

- Flammability range
- Ignition temperature
- Flash point

FACTORS IMPORTANT IN COMBUSTION

Combustion is the burning of any substance, whether gaseous, liquid, or solid.

Flammability is the ability of a material to generate a sufficient concentration of combustible vapors to be ignited. The **flammable range** is the range of vapor-air mixtures which will support combustion. It is bounded by the **upper flammable limit (UFL)** or the highest concentration of a product that is flammable and the **lower flammable limit (LFL)** or lowest concentration of a product that is flammable. Concentrations outside this range that are too vapor-rich or too vapor-poor, will not ignite.

Combustion and flammability have technical and regulatory definitions. It is important to understand this difference. (The technical, or scientific, definition is given here). The Department of Transportation has its own definitions for flammable and combustible. Any liquid with a flash point of 100°F or less is considered flammable. Any liquid with a flash point greater than 100°F is considered combustible. This is strictly a regulatory definition. What's the difference between material with a flash point of 99°F and one with a flash point of 102°F?

Ignition temperature is the minimum temperature to which a substance in air must be heated in order to initiate, or cause, self-sustained combustion independent of the heating element.

Ignition temperature is also referred to as "auto-ignition temperature." Ignition temperature is important in many applications, but not so much for determining fire hazard,

strangely enough. For instance, gasoline is much more of a fire hazard than diesel, yet the auto-ignition temp of diesel is at least 100°F less than gasoline!

Flash point is the minimum temperature at which a substance produces sufficient flammable vapors to support a flame when an ignition source is present.

The availability of vapor, not the ignition temperature, is the key indicator of hazard.

Table 2-1 delineates fire hazard properties of various flammable liquids, gases, and volatile solids.

TABLE 2-1
FIRE HAZARD PROPERTIES OF PETROLEUM PRODUCTS

Chemical	Flash point °F (°C) Lower	Ignition temperature °F (°C) Upper	Flammable limits % by vol.		Specific gravity (Water=1)	Vapor density (Air=1)	Boiling point (°C)
Benzene	12 (-11)	928 (498)	1.3	7.9	0.9	2.8	176 (80)
Fuel oil, No. 6	150-270 (66-132)	765 (407)			1.0		
Gasoline, ¹ C _x H ₁₂ to C _x H ₂ O	-45 (-43)	536 (280)	1.4	7.6	0.8	3-4	100-400 (38-204)
Gasoline, ¹ aviation	-50 (-46)	824 (471)	1.3	7.1			
Toluene	40 (4)	896 (480)	1.2	7.1	0.9	3.1	231 (111)
m-xylene	81 (27)	982 (527)	1.1	7.0	0.9	3.7	282 (139)

Chemical	Water solubility	Extinguishing method	Hazard Identification	
			Health	Flammability
Benzene	No ²	1	2	3
Fuel oil, No. 6	No ²	0	2	0
Gasoline, ¹ C _x H ₁₂ to C _x H ₂ O	No ²	1	1	3
Gasoline, ¹ aviation	No ²		1	3
Toluene	No ²	1	2	3
m-xylene	No ²	1	2	3

Fire hazard properties of some flammable liquids, gases and volatile solids (abstracted from NFPA 325M-1984, p. 9-95, 1984).

¹ Values may vary for different gasoline grades.

² Water solubilities are very low.

FLASH POINT/FLAMMABILITY RELATIONSHIP

- **Highly Flammable** Flash point < 100°F
- **Moderately Flammable** Flash point > 100°F but < 200°F
- **Relatively Inflammable** Flash point > 200°F

RELATIONSHIP OF FLASH POINT AND FLAMMABILITY

The relative flammability of a substance is based on its flash point.

Flash point is defined as the minimum temperature at which a substance produces sufficient flammable vapors to ignite when an ignition source is present. An ignition source could be the spark from static electricity, an electrical tool, or a wayward cigarette butt.

Note: In the case of liquids, it is not the liquid itself that burns, but the vapor above it.

Flash point is the single most important factor to look at in determining fire hazards. Flash points are determined by the National Fire Protection Association (NFPA). If the temperature of a liquid has reached the flash point, or higher it will be ignited by a spark, if the fuel/air mixture is right. There is a value called the "Fire Point." The "Fire Point" is the temperature the liquid must reach to generate enough vapors to sustain a flame. For practical purposes, however, we are only concerned with the flash point. If the liquid is at the flash point, and an ignition source is present, there will be a fire.

There are two methods of measuring flash point: open cup (o.c.) and closed cup (c.c.). The open cup method does not attempt to contain the vapors as they are generated, while the closed cup method does. The closed cup flash point is always lower than the open cup, since the concentration of vapors are not lowered by dispersion. This is important to UST inspectors, who deal with closed containers and confined areas frequently.

Flash points do not apply to solids or gases. Finally, flash points are variable. Gasolines are different, and lab tests differ. It is not uncommon to see flash points differ 10° from one reference to the next; therefore, it is recommended that one allow a generous margin of safety.

FLAMMABLE CHARACTERISTICS OF GASOLINE

- **Readily generates flammable vapors at atmospheric temperatures (NFPA = 3)**
- **Flash point: -45°F**
- **Flammability limits: LFL = 1.4 percent; UFL = 7.6 percent**

FLAMMABLE CHARACTERISTICS OF GASOLINE

NOTES

Gasoline is one of the most dangerous petroleum products because it readily generates flammable vapors at atmospheric temperatures (down to -45°F) and generates these vapors within an UST. It is this vapor, not liquid gasoline itself, that burns or explodes when mixed with air and an ignition source. In addition, gasoline has a very low flash point that means even the smallest source of ignition can cause an explosion.

The concentration of vapors in USTs storing gasoline is normally too rich to burn, that is, above the upper flammability limit (UFL). However, if the temperature of the liquid gasoline is in the -10°F to -50°F range, the concentration of vapors will be within the flammable range.

The National Fire Protection Association (NFPA) developed Standard 704M, a five step ranking system from 0 (lowest) to 4 (highest), to identify relative hazard levels. The NFPA standard addresses three categories: flammability, health, and reactivity. Gasoline is rated 3 in the NFPA category for flammability. An NFPA value of three indicates that gasoline is a liquid that readily ignites under typical ambient conditions.

FLAMMABLE CHARACTERISTICS OF GASOLINE (con.)

<u>Rating</u>	NFPA Flammability	Example
0	Will not burn in air when exposed to 1500° for five minutes.	Asbestos
1	Material must be preheated before it will burn.	Diesel
2	Materials that must be moderately heated before ignition can occur. "Liquids with flash points between 100°-200°F."	
3	Materials can be ignited under most ambient conditions.	Gasoline
4	Materials that rapidly disperse in air and burn readily.	Flammable gases

FLAMMABLE CHARACTERISTICS

Middle Distillate Fuels

Diesels and fuel oils No. 1 and 2	Relatively non-flammable (NFPA rating = 2)
Kerosene grades Jet-A/A-1, JP-5/7/8	Relatively non-flammable (NFPA rating = 2)
Jet B, JP-4 (gasoline/kerosene blends)	Greater fire hazard (NFPA rating = 3)

FLAMMABLE CHARACTERISTICS OF MIDDLE DISTILLATES

Much of the nomenclature in the petroleum industry is rather vague. For instance, fuel oils can be classed as middle, heavy, or residual distillates. Jet fuel may range from kerosene-like blends, with middle distillate properties, to blends more like gasoline, a light distillate. Don't get hung up on the light-middle-heavy-residual distillate terminology. It is general. Look at the properties of the fuel or oil of concern.

Middle distillates are the fractions of crude oil which possess a moderate boiling point. These fractions include kerosene, aviation fuels, diesel fuels and Fuel Oil Nos. 1 and 2, and have a wide range of flammabilities.

The **diesel fuels and fuel oils** are relatively non-flammable. They require limited heating at ambient temperatures to ignite. Flammability is expressed in units (percent) by volume of the material in air. The lower flammability limit (LFL) for diesel fuel is 1.3 percent. The upper flammability limit (UFL) is 6 percent.

While diesel is not typically a flash hazard, if the fuel is spilled on hot concrete or metal, or stored in direct sunlight, the heat may be sufficient to make diesel a serious hazard.

Aviation fuels are divided into the kerosene grades (Jet A, A-1, JP-5, 7 and 8) and the "wide cut" blends of gasoline and kerosene (JP-4 and Jet B). Wide cuts are lighter blends

and more closely resemble gasoline. The kerosene grades are relatively non-flammable, but the wide cut blends represent a significantly higher fire hazard.

The vapor space in a tank storing a low vapor pressure liquid, such as kerosene, contains a mixture too lean to burn, that is, below the LFL. The vapor space of UST storing materials such as JP-4 and Jet B (and other liquids of similar vapor pressure between 2 and 4 psi) presents a fire hazard because the vapors are normally in the flammable range.

FLAMMABLE CHARACTERISTICS

Residual Fuels (Fuel Oil Nos. 4, 5, 6)

Relatively non-flammable

- NFPA = 2

Flash points

- Nos. 4, 5 130°F to 335°F
- No. 6 150°F to 270°F

LFL

- Nos. 4, 5, 6 1.0 percent

UFL

- Nos. 4, 5, 6 5.0 percent

FLAMMABLE CHARACTERISTICS OF RESIDUAL FUELS

NOTES

Residual fuels (Fuel Oils Nos. 4, 5, and 6) are defined as the product remaining after the removal of appreciable quantities of the more volatile components of crude oil. They have a high flash point: ignition will not occur until the liquid reaches a temperature of 130 or higher. They are not as dangerous as gasoline, however, they do pose a threat.

FLAMMABLE CHARACTERISTICS

Used Oils

- Significant variability exists
- Solvent additions may reduce flash point
- 30 percent of 1,000 samples tested = flash point < 140°F

FLAMMABLE CHARACTERISTICS OF USED OILS

NOTES

Used oils in general are relatively non-flammable, yet they pose special dangers. The characteristics of used oils are not uniform because the oils take on additional characteristics and components during use. Thus, used oils may contain toxins or other dangerous products of which an inspector may not be aware.

For instance, the "other products" (often solvents) found in used oils can greatly reduce their flash point, making them much more flammable. Virgin lubricating oil has a flash point of 350°F. By comparison, when 1,000 samples of waste oils were tested, 30 percent of them had a flash point under 140°F.

The components of some used oils, particularly chlorinated solvents, pose a special toxicological hazard in a fire because of their ability to release toxic fumes.

All associated hazards are affected by ambient conditions. For instance, a used oil may be difficult to ignite, but if a nearby fire heats the oil it may ignite and burn fiercely.

EXPLOSIONS

- Rapid chemical reactions producing large quantities of gas and heat
- Explosivity is expressed as percent by volume of material in air, with levels the same as for flammability (that is, LEL/UEL)
- Not always result of combustion; may occur when compressed vapors expand and burst a container

EXPLOSIONS

Explosions are rapid chemical reactions that produce large quantities of gas and heat, a shock wave, and noise. **Explosivity** is expressed as a percentage of a given material in a volume of air. The lower explosivity limit (LEL) is the lowest concentration of a product that is explosive. The upper explosivity limit (UEL) is the highest concentration of a product that is explosive.

UEL and LEL, for all intents and purposes, are the same as UFL and LFL.

Generally, explosions can do serious harm much more rapidly than toxic exposure. Explosions and fires are the most immediate hazard during tank removal or closure activities, and when release investigation techniques are performed in a confined space.

Bear in mind that the difference between a fire and explosion is not a large one. It can simply be the speed of the reaction. Any material that can burn, if placed under sufficient heat, and confined as in a tank, can explode with tremendous force.

Explosions are not necessarily the result of combustion. In a closed container (such as an UST), flammable liquids expand when heated. Gasoline, for example, expands about 0.06 percent in volume for every 10°F increase in temperature. When the pressure inside the UST exceeds the designed pressure resistance, a "pressure release explosion" can occur.

Although not directly related to standard petroleum products, **Boiling Liquid Expanding Vapor Explosions (BLEVEs)** are important due to their tremendous destructive force. BLEVEs occur when compressed gases, such as LPG, are stored as liquids at temperatures above their normal boiling points. If the vessel is exposed to a fire, the rapid buildup of pressure coupled with heat-induced weakening of the tank sides, results in a sudden and violent rupture, with the superheated liquid vaporizing and creating a fireball.

WORKING NEAR EXPLOSIVE VAPORS OR IGNITABLE LIQUIDS

- Use only explosion-proof cameras
- Remove flash camera batteries, or do not use
- Do not smoke or use matches or lighters
- Immediately change oil-saturated clothing

WORKING NEAR EXPLOSIVE VAPORS OR IGNITABLE LIQUIDS

NOTES

If an inspector discovers that vapors or liquids are present in a confined structure and a rapid assessment indicates the potential for an explosion or fire, the inspector should take general safety measures at once.

- All persons should be kept away from the danger area, except those properly trained and equipped.
- The local fire department should be alerted.
- A trained operator of a combustible gas indicator should determine the concentration of vapors present. Oxygen levels must also be monitored.
- Persons in the area should not smoke, start or use vehicles or equipment with internal combustion engines, or touch electrical switches or extension cords.
- Instruments used at UST sites must not contribute to the potential for an explosion or fire. Insurance and safety organizations have developed codes for testing electrical devices used in hazardous situations, and an electrical instrument certified for use in hazardous locations will indicate this. If an instrument does not have an approved rating, it should not be used in a hazardous or potentially hazardous situation.

PURGING

- Controls "fuel" point of fire triangle
- Replaces flammable vapors with air
- Reduces flammable vapors (<LEL)
- Assure procedure's effectiveness with monitoring equipment

PURGING

Purging is an effective method for controlling the fuel point of the fire triangle. The goal of purging a tank is to reduce the flammable vapors in the tank well below the lower explosive limit. Purging or ventilating the tank dilutes the tank's flammable vapors with air, reducing the mixture of fuel and oxygen.

An eductor-type air mover, typically driven by compressed air, draws vapors out of the tank and forces fresh air into the tank. The fill (drop) tube should remain in place to ensure proper ventilation of the tank bottom. Discharge vapors should be dispersed 12 feet from the tank in order to ensure that flammable vapors are being vented effectively into the upper atmosphere.

Most petroleum products have a flammable range of 1 to 10 percent by volume in air, the amount of fuel vapor necessary to become flammable in the presence of oxygen and an ignition source. Below a fuel vapor level of 1 percent (the lower explosive limits or LEL), the mixture of fuel and oxygen is too small to support combustion.

Purging should not be undertaken on hot, humid, or still days because the still air will not disperse the flammable vapors. In order to maintain safe conditions, site work should be put off for a day.

Purging is a temporary procedure. Product trapped in bottom sludge and wall scale regenerates flammable vapors inside the tank. Therefore, when purging, lower the flammable

concentration to 20 percent of the accepted LEL value of the mixture. The tank should be constantly monitored to ensure that LEL value does not exceed 20 percent.

Use a Combustible Gas Indicator (CGI) to measure the reduction in the concentration of flammable vapors during purging. Periodically test the percentage LEL inside the tank, in the excavation, and any other below grade areas.

CAUTION: In air purging, with plenty of oxygen present, the concentration of vapors in the tank begin in the flammable range, or may go from too rich through the flammable range before a safe concentration is achieved. It is especially important to ensure all ignition sources have been removed from the area before beginning this process.

INERTING

- Controls "oxygen" point of fire triangle
- Displaces oxygen with inert gas
- Reduces oxygen below the combustion level
- Common inerting materials: dry ice (CO₂) and compressed nitrogen
- Assure procedure's effectiveness with oxygen meter

INERTING

Inerting controls the oxygen element of the fire triangle. Inerting reduces the concentration of oxygen needed to support combustion (below 12 to 14 percent oxygen by volume) by replacing the oxygen with an inert gas.

Common inerting materials include dry ice (CO₂) and compressed nitrogen. During the inerting process, gases should be introduced under low pressure in order to avoid producing static electricity. CO₂ is best applied in solid, dry ice form, rather than as a compressed gas.

It is important to recognize that the inert gas does not "neutralize" the flammable vapors in the tank; it simply displaces the oxygen. To measure the effectiveness of the inerting procedure, test the air inside the tank with an oxygen indicator. Eight percent or less oxygen by volume is a safe and acceptable level.

NOTES

IGNITION SOURCES

- Static electricity
- Electrical appliances
- Open flame
- Smoking cigarettes
- Lightning
- Sparks

IGNITION SOURCES

NOTES

The Ignition Source is the easiest point of the fire triangle to control.

There are many possible sources of ignition during handling and transfer of petroleum products. These sources include static electricity, sparks generated by tools, monitoring equipment and engines in the area, lit cigarettes, or even electrical appliances and lightning. Any one of these ignition sources is enough to complete the fire triangle.

SPARK GENERATION

Sparks can be generated by:

- Static electricity
- Striking tank with a metal instrument (hammer, backhoe)
- Striking rock with metal during excavation
- Electrical instruments (camera, drill)

SPARK GENERATION

NOTES

Sparks can be generated at an UST site by static electricity, striking metal on metal, such as a hammer on the tank, or striking metal on rock, as when digging with a backhoe. Sparks are also created by the ignition of electrical or combustion engines and pumps, use of non-intrinsically safe monitoring instruments, and lightning. Precautions need to be taken to eliminate the possibility of these activities causing fire and explosions.

STATIC ELECTRICITY SOURCES

- Tank filling (by splashing and movement against piping surface)
- Settling of rust or sludge particles
- Motorized equipment
- Self-generation by humans
- Induction

STATIC ELECTRICITY SOURCES

NOTES

The primary manifestation of static electricity is the discharge or sparking of accumulated charges. Under the right conditions, these sparks can be the ignition source for a fire or explosion. Sparks can also be self-generated by humans or created through induction.

The static charge resulting from flowing liquids is of primary importance during the transfer of petroleum products. Static electricity is generated by the separation of like and unlike bodies. When liquid flows, charging occurs because absorbed ions are separated from free ions that are carried into the body of the liquid by turbulence. For example, static results from liquid dropping into a tank during product deliveries, liquid flowing through a hose when product is pumped from the tank, or compressed gas or air being released into the tank atmosphere.

During product transfer, static electricity can be generated by the flow of fuel through small holes into the tank. The movement of the fuel against the pipe also generates a static charge. Furthermore, static electricity can be generated by the settling of rust or sludge particles.

Motorized equipment used during tank installation, testing, and closure may generate static electricity. In order to minimize such risk personnel should ground all equipment during operation.

REDUCING STATIC ELECTRICITY AND SPARKING

Two effective methods

Bonding

- equalizes static electricity
- creates conductive connection between two entities (such as UST and tank truck)

Grounding

- diverts static electricity into earth
- eliminates static buildup

REDUCING STATIC ELECTRICITY AND SPARKING

NOTES

Bonding and **grounding** are effective methods to reduce the potential for electrostatic charge generation and sparking, and the subsequent chance of fires and explosions.

Bonding entails running a conductive line from one metal object to another. This equalizes static electricity by creating a conductive connection between two objects, reducing the likelihood of sparks jumping from metal to metal. Cargo tanks should be electrically bonded to the fill stem, piping, or steel loading rack. Also, all metal parts of the fill pipe assembly should form a continuous electrically conductive path downstream from the point of bond connection.

Bonding insures that individual components of a system do not build up charges. In essence, you slow down the charge buildup by distributing it over a bigger area. However, the entire bonded system will eventually build a significant charge. Bonded systems should also be grounded.

Grounding entails running a conductive line from a metal object to the ground. This will dissipate any charge on the outside surface of the tank by having it flow into the ground.

FIRE AND EXPLOSION POTENTIAL

Potential greatest when handling or transferring product

Installation/Upgrades

Explosion can occur during pressure testing

Release Investigation

Spilled product or vapors

Leak Detection Testing

Presence of leaking product or vapors

Installation of Monitoring
Wells/Sampling

Drilling into buried utility lines

FIRE AND EXPLOSION POTENTIAL

NOTES

Assuming an UST is well-maintained, the greatest fire and explosive hazard occurs during the transfer of the product to or from storage and during the cleaning and removal of USTs.

Although petroleum products have been handled and transferred safely for decades, UST inspectors should not believe that this transfer is risk- and hazard-free.

The transfer of flammable and explosive products (liquids and vapors) may occur during tank testing or repair, tank upgrades, tank closure or removal, tank re-filling or corrective actions. UST inspectors should be aware of the risks associated with these activities.

Due to the danger of violent rupture, use extreme caution when performing pipe and tank testing during tank installation. Do not pressure-test any piping or tanks that contain flammable or combustible liquids. Do not exceed internal tank pressures of 5 pounds psig during pressure testing. Install a pressure relief valve at 6 pounds psig. Use a pressure gauge with a range of 10 to 15 psig, and test

FIRE AND EXPLOSION POTENTIAL (con.)

Closures and removals

Product or vapors present while draining tank
If vapors removed, product may remain trapped in sludge
Vapors can regenerate in inert or purged tank

both the inner and outer shells of double-wall tanks. Outer wall should be filled by bleeding off pressure from the inner tank. Do not pressurize directly. Avoid standing near endcaps of an UST. The endcaps are the most vulnerable to explosion.

Whether a tank is to be removed from the ground, or closed in place, product trapped in the sludge at the bottom of the tank, absorbed in the tank walls, or trapped under the scale is a continuous source of vapor regeneration. Cleaning the tank will decrease the amount of vapor regeneration.

To make it safe for handling, after the tank is purged or inerted the sludge can be washed to one end of the tank and pumped out while the tank is still in the excavation. If the scale is stubbornly caked on, the contractor may have to enter the tank for manual cleaning. Make sure appropriate safety procedures are followed (see Confined Space Entry in Section 3), and a continuous stream of fresh air is introduced into the tank. Make sure the contractor blocks the tank to prevent any movement. If tank sludge contains sufficient lead or other substances to be considered a hazardous waste, it must be handled and disposed of consistent with the Resource Conservation and Recovery Act (RCRA), Subtitle C requirements.

Tanks should be removed from the site as promptly as possible after purging or inerting procedures have been completed, preferably the same day. If the tank remains on-site overnight or longer, additional vapor may be

regenerated from any liquid, sludge, or wall scale remaining in the tank. Regardless of when they are removed, tanks should be checked with an explosimeter to ensure that 20 percent of the lower explosivity limit (LEL) is not exceeded.

If a leak has occurred, contaminated soil and free product will also generate vapors outside of the tank. An explosimeter should be used to check explosive levels in the excavation as well as in the tank itself.

OXYGEN DEPLETION

CAUSES OF OXYGEN DEPLETION

- Gasoline vapors displace oxygen in confined spaces.
- Oxygen is consumed through oxidation (rusting).
- Inert gas is pumped into tank.
- Other gasses displace oxygen in sewers, manholes, and tunnels.

CAUSES OF OXYGEN DEPLETION

NOTES

Oxygen content in the air may decrease due to biological decay, oxidation (rusting), combustion or displacement by other gases, such as methane, hydrogen sulfide, and carbon monoxide.

It is critical to keep in mind that even when oxygen concentration is deficient for human well-being, there may be enough oxygen to oxidize a combustion or explosion. For example, a 16 percent oxygen concentration could be sufficient for a fire or explosion, while being too low for humans to comfortably breathe.

Eleven percent O₂ is considered the theoretical lower limit for a fire. However, a reaction with a strong oxidizer could result in a flame in the total absence of oxygen.

HAZARD AREAS FOR OXYGEN DEPLETION

- Tanks
- Excavations
- Basements
- Sewers
- Any confined space

HAZARD AREAS FOR OXYGEN DEPLETION

NOTES

Oxygen depletion can occur in any confined space, especially those typically encountered by UST inspectors. Tanks and dug-out trenches are potentially oxygen deficient; basements and sewers are other areas where oxygen may be depleted. Old USTs are particularly susceptible to oxygen depletion through oxidation.

Inspectors should always be alert to situations that could create oxygen depletion, and should never enter into such situations without first measuring the oxygen level.

EPA considers the minimum level of oxygen for a safe entry to be 19.5 percent. Below this entry into an oxygen-depleted area is absolutely necessary, inspectors must enter with an air supplying respirator. Air purifying respirators are not permitted in atmospheres containing less than 19.5 percent oxygen.

PHYSIOLOGICAL EFFECTS OF OXYGEN DEPLETION

Typical air is 21 percent oxygen.

Health effects at lower oxygen levels:

16 to 21 percent	Accelerated breathing and heartbeat; impaired attention, thinking, and coordination
10 to 14 percent	Faulty judgment; poor muscular coordination; rapid fatigue, possibly permanent heart damage
6 to 10 percent	Nausea; vomiting; loss of movement; unconsciousness
< 6 percent	Death in minutes

PHYSIOLOGICAL EFFECTS OF OXYGEN DEPLETION

Oxygen depletion produces a range of physiological effects that worsen as oxygen content is lowered or exposure time is increased. Generally, there are no detrimental effects above a 21 percent concentration oxygen in air, which is the general concentration of oxygen in air at sea level (it could be more or less in other geographical areas). Below this concentration, however, potential life threatening situations exist.

The first signs of depletion occur when oxygen concentration is between 16 percent and 21 percent. With this level of oxygen, a person's respiration and heartbeat accelerate. Also, attention and coordination begin to be impaired. Lower concentrations of oxygen can cause rapid fatigue, heart damage, nausea, unconsciousness and death. See Figure 2-1 for an oxygen scale illustrating the physiological effects of depletion.

Many times, O₂ depletion occurs in a very seductive fashion. The victim may simply become sleepy, and suddenly see nothing wrong with closing the eyes for a short nap, from which he does not wake. The impairment of judgement is drastic, but insidious. After all, it is hard to be alert to symptoms that involve loss of alertness. Plan ahead and use your

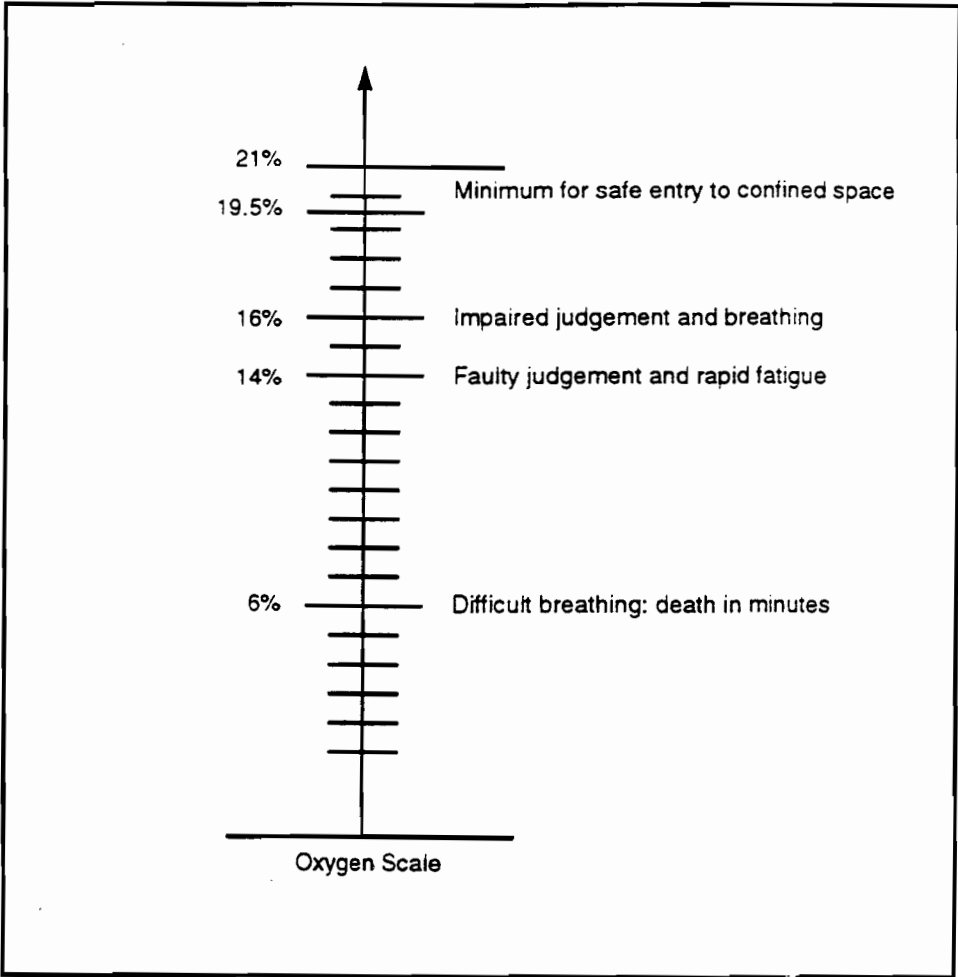
instrumentation.

When on-site, UST inspectors should be alert to the symptoms outlined in the page above. If they experience any of these symptoms in a confined space, they should immediately leave the area and seek medical attention if necessary.

Asphyxiation is most likely to occur in low-lying areas where heavier-than-air vapors accumulate. An exception to this is methane, or natural gas, which is slightly lighter than air, and may rise to higher levels. Methane is a simple asphyxiant, having no true toxic effect, but it is extremely flammable.

FIGURE 2-1

SUMMARY OF THE EFFECTS OF OXYGEN DEPLETION



ACTIVITIES HAVING ASPHYXIATION POTENTIAL

Petroleum Release Investigations

- entering sewers, basements, trenches

Tank Removals/Repairs

- entering inerted tanks
- entering trenches

NOTES

TOXICITY

EXPOSURE ROUTES

- Inhalation
- Skin Absorption
- Ingestion

EXPOSURE ROUTES

There are a number of general symptoms which result from toxic exposure to most of the compounds found at petroleum UST sites. These symptoms include irritation of the eyes, mucous membrane and respiratory tract as well as depression or excitation of the central nervous system.

Petroleum products generally enter the body through inhalation of vapors, absorption (skin or eye contact), or ingestion. Of these three routes, inhalation is the quickest and most efficient route into the body. The adverse affects of inhalation of toxins can be almost instantaneous because the lungs quickly transfer the toxin into the bloodstream. The toxic effect will be proportional to the concentration of the toxin, its toxicity, and the individual's sensitivity to the toxin.

The symptoms of **inhalation** can be vague. Headaches, nausea, dizziness, insomnia, and tremors should not be overlooked.

Exposure via **ingestion** of contaminated water is generally limited, as petroleum in water can be detected by most people in levels as low as 1 ppm.

Visual and olfactory clues as well as site safety screening instruments should be used to assess exposure hazards. Visual cues include seeing stained soils, vapors, or iridescence in water.

Vapors from petroleum products can be smelled when they are at levels far below those considered toxic to humans. However, UST inspectors should not rely solely on their senses to detect toxic levels of vapors.

particularly since noses become desensitized to some odors after prolonged exposure. Olfactory sensitivity also decreases with age.

Table 2-8 summarizes the various types of petroleum products and their exposure potentials, exposure target organs and acute and chronic symptoms. Each of these areas is discussed in detail throughout this section.

TYPES OF EXPOSURE

Acute exposure

- short-term, high-level exposure
- effects are usually immediate

Chronic exposure

- long-term, low-level exposure
- effects may take years to appear

TYPES OF EXPOSURE

NOTES

An inspector can face either chronic or acute exposure at a site. **Chronic** is defined as long-term, low-level exposure, while **acute** is defined as short-term, high-level exposure. Both are dangerous and have immediate and long-term health implications. UST-associated work can also expose workers to multiple chemicals which may have **synergistic** effects. This means that the effect of two chemicals together may be greater than the sum of their separate effects. All exposures should be kept as low as reasonably achievable.

Many materials stored in USTs are very common, and many have very low acute toxicity. However, the exposures of the UST inspector are more frequent, of longer duration, and higher than those of the average person. It is this repeated, low-level exposure that is so dangerous, as effects may not be seen for many years. Avoiding unnecessary exposure now can help you enjoy your later years, instead of combatting a chronic illness.

Most exposure can be eliminated if common clues, such as strong odors and instrument readings, are heeded.

ACTIVITIES HAVING TOXIC EXPOSURE POTENTIAL

Release investigations/corrective actions

- petroleum product and vapors
- H₂S in sewers
- asbestos and termiticides in basements

In-place tank closure

- vapors, product, and sludges

Tank/pipe repair/removal

- product and vapors
- "coating" chemicals and petroleum

Leak detection testing

- product and vapors

GENERAL SYMPTOMS OF TOXIC EXPOSURE

- Irritation of eyes, mucous membranes, and respiratory system
- Central nervous system depression and/or excitation
- Headache, nausea, drowsiness, dizziness, insomnia, confusion, tremors
- Dry and red skin upon contact

TOXICITY OF GASOLINE CONSTITUENTS

All petroleum products share the characteristic of causing central nervous system depression. The early symptoms of acute over-exposure can include dizziness, drowsiness, impaired coordination, nausea, euphoria, convulsions, coma, and death, in high enough doses.

The primary route of exposure for these products is **inhalation**. If the products are ingested, do not induce vomiting, since the product may be aspirated into the lung easily. Activated charcoal, followed by "stomach pumping," is the preferred treatment.

Skin contact is not typically an immediate hazard. Prolonged contact will cause burning and blistering. Repeated exposures to skin will result in defatting and possible dermatitis.

ALKANES

Hexane may be the most toxic member of the alkanes. It comprises 11 to 13 percent of gasoline by weight. **Acute exposure** to hexane occurs primarily through inhalation. Vertigo, headaches and nausea are the first symptoms of exposure to be noticed. At high concentrations, central nervous system (CNS) depression results in a narcosis-like state.

Pre-narcotic symptoms occur at vapor concentrations of 1,500 to 2,500 ppm as the central nervous system is depressed. Skin contact primarily causes fat removal and irritation. Hexane also irritates the eyes and mucous membranes with even a fairly short-term exposure, for example, 880 ppm for 15 minutes.

Chronic exposure to hexane vapors causes nerve damage. The first clinical sign of nerve damage is a feeling of numbness in the toes and fingers. Further exposure leads to increased numbness in the extremities and to loss of muscular stretching reflexes. Paralysis develops with varying degrees of impaired grasping and walking. In the most severe cases nerve conductivity is neutralized and cranial nerve involvement is also observed and may require several years to recover. In mild or moderate cases, recovery begins six to 12 months after exposure ceases.

Octane, if it is taken into the lungs, may cause rapid death due to cardiac arrest, respiratory paralysis, and asphyxia. It has a narcotic potency similar to heptane. Prolonged skin contact results in a blistering and burning effect.

TOXICITY: AROMATICS

Acute Exposure

- central nervous system effects
- may cause dermatitis, vertigo, headache, nausea, and vomiting

Chronic Exposure

- benzene is a carcinogen, linked to leukemia
- increased risk of kidney cancer and lymphoma
- nerve damage, possible paralysis

TOXICITY OF AROMATICS

NOTES

It is almost impossible to assign a fuel product's acute effects to any given component, since they all have similar actions. Worrying about air concentrations of specific components is not practical. We typically look at total organics.

Benzene is found at concentrations up to 4 percent by weight in gasoline. Older gasolines may contain as much as 13 to 15 percent benzene. **Acute exposure** will depress the central nervous system (CNS) and may cause acute narcotic reactions. The lowest observed threshold for acute exposures is 25 ppm. Headaches, lassitude, and dizziness may become increasingly evident at exposures between 50-250 ppm. Concentrations of 3,000 to 7,500 ppm may result in toxic signs within the hour. Depending on the concentrations and duration of exposure, these effects range from mild symptoms such as headaches and light-headedness to more severe effects such as convulsions, respiratory paralysis, and death. Skin absorption is not considered to be as important a route of entry as inhalation or ingestion because skin absorption is extremely low, with the highest absorption through the palm. Direct contact with the liquid may cause redness and dermatitis.

TOXICITY: AROMATICS (con.)

NOTES

Benzene is a known carcinogen. Chronic exposure to benzene has been linked to leukemia and irreversible chromosome damage. At the early stages, reversible leukemia, anemia, or a decrease in the blood platelet count may occur. Continued exposure leads to severe bone marrow damage, which results in a deficiency of all cellular elements of the blood. The direct, life-threatening consequence of this is an increased susceptibility to infection and hemorrhaging. The lowest air levels of benzene capable of producing these effects are in the range of 40 to 50 ppm. Effects of high exposure levels (>100 ppm) may persist for many years after exposure has been discontinued. The most important effect resulting from chronic benzene exposure is its hematotoxicity, the targets being the cells of the bone marrow. UST workers may be exposed to as much as 10 ppm in their everyday activities.

Toluene is found in concentrations of up to 4 to 7 percent in gasoline. The primary hazard of acute inhalation exposure is CNS depression. Reaction times will begin to be impaired after exposures of 20 minutes at 300 ppm. Toluene will also cause eye irritation, and prolonged or repeated skin contact may cause dermatitis. As concentrations increase, symptoms can include: muscular fatigue, confusion, tingling skin, euphoria, headache, dizziness, lacrimation, dilated pupils, eye irritation, nausea, insomnia, nervousness, and impaired reaction time. Occupational exposure to toluene has been linked to a higher reported incidence of menstrual disorders. Children born to these women may experience more frequent fetal asphyxia and be underweight.

Xylenes are found in concentrations of 6 to 8 percent in gasoline. Short-term inhalation exposures are associated with narcotic effects on the central nervous system, and high concentrations may lead to CNS depression. Both liquids and vapors are irritating to the skin, eyes, and mucous membranes. Skin absorption of xylenes occurs readily and xylenes can also be transferred across the placenta. Incomplete brain development has been reported in the fetuses

of mothers exposed to xylene. **Chronic**, high-level human inhalation exposure results primarily in CNS effects, lack of coordination, nausea, vomiting, and abdominal pain. There are variable effects on the liver, kidneys, and gastro-intestinal tract. Chronic effects of xylenes resemble the acute effects but are more severe. They include headache, irritability, fatigue, digestive and sleep disorders, CNS excitation followed by depression, tremors, apprehension, impaired memory, weakness, vertigo, and anorexia. Xylenes are skin irritants and prolonged contact may cause formation of blisters.

Ethylbenzene is known to be toxic to the liver and kidneys. It will irritate the skin, eyes, and upper respiratory tract. Inhalation of small amounts may exacerbate the symptoms of obstructive airway diseases and cause extensive fluid buildup and hemorrhaging of lung tissue. Although a tolerance to the eye and respiratory effects may develop after a few minutes, CNS effects will usually begin at this stage, leading to CNS depression.

TOXICITY: GASOLINE ADDITIVES

- Tetramethyl and tetraethyl lead (TML and TEL)
- Ethylene dibromide (EDB) and ethylene dichloride (EDC)
- Tri-ortho-cresyl-phosphate (TOCP)

TOXICITY OF ADDITIVES

Gasoline often contains substances that have been added to improve the fuel's performance properties. Gasoline additives of general concern for leaded gasolines are tetramethyl lead (TML) and tetraethyl lead (TEL), as well as ethylene dibromide (EDB) and ethylene dichloride (EDC). Both TML and TEL are used as anti-knock agents; EDB and EDC are used to prevent lead deposition. These compounds are present in low concentrations in gasoline (relative to benzene, toluene, and xylene), but they are quite toxic.

TML and TEL can be absorbed through the skin, ingested, or inhaled. TEL intoxication is caused by inhalation or absorption through the skin. Acute intoxication can occur through absorption of a sufficient quantity of TEL either through brief exposure at a very high rate (100 mg/m³ for 1 hour) or for prolonged periods at lower concentrations. Exposure can cause acute intoxication, liver and thymus damage, and possibly death from a combination of depression of the central nervous system, respiratory irritation, and bronchiolar obstruction.

Most severe exposure to TEL and TML have resulted from sniffing gasoline. Some victims have shown the symptoms listed as well as fluid buildup in the brain, resulting in swelling and increased intracranial pressure.

NOTES

The signs and symptoms of exposure are often vague and easily missed. The onset of symptoms may even be delayed up to 8 days after exposure and include weakness, fatigue, headache, nausea, vomiting, diarrhea, anorexia, insomnia, and weight loss. Symptoms peculiar to TEL exposure are the sensation of hairs in the mouth and the feeling of insects crawling on the body.

As intoxication worsens, there is confusion, delirium, manic excitement, and catatonia. Nightmares, anxiety, and anorexia are also seen. Loss of consciousness and death may follow after several days. Severe intoxication causes recurrent or continuous episodes of disorientation and intense hyperactivity which may rapidly convert to convulsions that may terminate in coma or death. TEL is likely to have adverse effects on human reproduction and embryonic development.

TOXICITY: MIDDLE DISTILLATE FUELS

- Kerosene, aviation fuels, diesel fuels, and Fuel Oil Nos. 1 and 2
- Oral, dermal, and inhalation exposure
- Major systemic reaction: central nervous system depression
- Skin and mucous membrane irritation
- Constituents of concern: polyaromatic hydrocarbons (PAHs), cresols, phenols

TOXICITY OF MIDDLE DISTILLATES

The **middle distillates** include kerosene, aviation fuels, diesel fuels, and Fuel Oil Nos. 1 and 2. They are referred to as the middle distillates because of the similarity in their degree of volatility during the distillation process. They can be taken into the body by ingestion, absorption, or inhalation.

Kerosene has the least amount of aromatic hydrocarbons of the middle distillate fuels, with benzenes, indanes, and naphthalenes being the major aromatic components. Kerosene and related hydrocarbons are irritating to the skin and mucous membranes, and skin absorption may be significant.

Jet and aviation fuels are mixtures of distillate hydrocarbons that vary in composition from those similar to motor gasoline to kerosene-based fuels used in commercial aircraft. Jet fuels contain additives such as anti-oxidants, metal deactivators, and de-icing agents.

Diesel fuels contain high amounts of naphthalenes, acenaphthalenes, phenanthrenes, and anthracenes. Dermal exposure to diesel oil is toxic to the kidneys.

Generally, No. 2 fuel oil (heating oil) contains a higher volume percentage of benzenes and naphthalenes compared to kerosene and diesel fuels.

Polynuclear Aromatic Hydrocarbons (PAHs) are present in higher concentrations in middle distillate fuels than in gasoline, but less than in the residual fuels. Specific PAHs detected in the middle distillates include naphthalene, benzo(a)anthracene, and benzo(a)pyrene. Benzo(a)anthracene and benzo(a)pyrene are known to be very **carcinogenic** (cancer-causing). PAHs have been shown to cause cytotoxicity in rapidly proliferating cells throughout the body, apparently inhibiting DNA repair. Cytotoxicity causes changes in the cytoplasm of the cell. The vascular system, lymphoid system, and testes are frequently noted as targets of PAHs.

No information about the carcinogenicity of middle distillates in humans is available. However, several members of the middle distillate family, in particular Fuel Oil No. 2 and diesel, have been shown to be weak to moderate carcinogens in animals. **Teratogenic** compounds affect fetal development. No teratogenic effects have been observed in animal tests using kerosene, diesel fuel, and Fuel Oil No. 2.

The chief systemic reaction to the middle distillates is depression of the central nervous system. Effects of exposure are expected to resemble those of kerosene, that is, low oral, moderate dermal, and high inhalation hazard. Symptoms include irritation to the skin and mucous membranes as well as headaches and nausea.

GASOLINE ADDITIVES: ACUTE EXPOSURE

- **Affects central nervous system**
- **Irritating to mucous membranes, eyes, and skin**
- **Severe respiratory tract irritation**
- **Vomiting, diarrhea, abdominal pain**
- **Delayed lung damage**

GASOLINE ADDITIVES: ACUTE EXPOSURE

Acute exposure to gasoline additives is a serious health threat. In general, brief exposure to additives (100 mg/m³ for 1 hour) can cause acute intoxication and depress the central nervous system. Symptoms include insomnia, confusion, headaches, and tremors, and may be delayed for up to 8 days.

Specifically, both EDB and EDC are highly toxic and identified as carcinogenic, although EDC has a much lower potency.

Acute exposure also causes vomiting, diarrhea, abdominal pain and, in some cases, lung damage. The vapor is irritating to the eyes and mucous membranes and may cause liver, kidney, and lung damage, including delayed pulmonary lesions. The liquid form is highly irritable to the skin, causing redness and blistering. Death has occurred following ingestion of 4.5 ml. Recent studies by NIOSH have shown adverse reproductive effects in men.

GASOLINE ADDITIVES: CHRONIC EXPOSURE

Chronic exposure to additives has equally serious health effects. In general, chronic human exposure is associated with adverse effects on the central nervous system, peripheral nerves, kidneys, and vascular system. Adverse effects are also likely on the human reproductive system and embryonic development.

Symptoms of chronic exposure include weight loss, anemia, emotional instability, and toxic psychosis. Recovery may take months to years, and 25 to 30 percent of cases never recover.

GASOLINE ADDITIVES: CHRONIC EXPOSURE

- **Weight loss, anemia, emotional instability, and toxic psychosis**
- **Adverse effects on central nervous system, peripheral nerves, and vascular system**
- **Adverse effects on reproductive and embryonic development**
- **Liver and kidney damage.**

MIDDLE DISTILLATE FUELS: SYMPTOMS OF ACUTE EXPOSURE

- Headache, nausea, mental confusion
- Irritation of respiratory tract, skin, and mucous membranes
- Hemolytic anemia
- Cardiovascular disturbances

MIDDLE DISTILLATE FUELS: SYMPTOMS OF ACUTE EXPOSURE

Acute exposure to middle distillate fuels can lead to headaches, nausea, mental confusion, and irritation of the respiratory system. Further exposure can cause hemolytic anemia and cardiovascular disturbances; in some extreme cases, loss of consciousness can occur. The compounds in the middle distillate fuels that are most likely to be of toxicological concern are non-carcinogenic PAHs, such as naphthalene; the carcinogenic PAHs, benzo(a)-anthracene and benzo(a)-pyrene; and cresols and phenols.

Ingestion or inhalation of naphthalene produces nausea, vomiting and disorientation. It is irritating to the skin and eyes and may cause cataracts. Benzo(a)-anthracene and benzo(a)-pyrene have been detected in Fuel Oil No. 2 and have been classified as probable human carcinogens.

Cresols are highly irritating to the skin, mucous membranes and eyes. They can impair liver and kidney function and cause central nervous system and cardiovascular disturbances. Phenol is toxic to the liver and kidneys.

Several of the components of gasoline are also found in the middle distillate fuels. For example, toluene, xylenes, and ethylbenzene are found in the middle distillates, although in much lower concentrations than in gasoline. Octane on the other hand, is present at much higher concentrations in aviation fuels than in motor gasoline. Additionally, a number of other substances may be found in the middle fractions of petroleum derivatives. These are

not covered in this course due to their numbers and complexity. These include components of jet fuel as well as jet and diesel fuel additives, such as Dodecane, Methylcyclopentane, N,N-Dimethylformamide, Manganese Compounds, peroxides, and Alkyl Nitrate and Nitrate/Nitro and Nitroso compounds.

**MIDDLE DISTILLATE FUELS:
IMPACTS OF CHRONIC EXPOSURE**

- Neurological effects
- Bronchopneumonia
- Toxic to liver and kidneys
- Toxic to vascular and lymphoid systems, and testes
- Probable human carcinogens

**MIDDLE DISTILLATE FUELS: IMPACTS OF
CHRONIC EXPOSURE**

NOTES

Chronic exposure to middle distillate fuels causes neurological effects. One study of aircraft workers consistently exposed to aviation fuel found that a majority experienced recurrent symptoms such as dizziness, headaches, and nausea. Feelings of suffocation, coughs, and palpitations were also prevalent. Inhalation of high concentrations of these vapors can lead to an acute and often fatal bronchopneumonia.

TOXICITY: RESIDUAL FUEL OILS

Fuel Oil Nos. 4, 5, and 6

Cracked bunker fuel and catalytically cracked clarified oil:

- both carcinogenic in animals
- cracked clarified oil is one of the most carcinogenic materials in petroleum refining

Contain higher concentration of polyaromatic hydrocarbons (PAH) than middle distillates, gasolines

TOXICITY OF RESIDUAL FUEL OILS

Fuel Oils Nos. 4, 5, and 6 are commonly referred to as the residual fuels. They are very viscous and have low water solubilities.

Residual fuels are blends of predominately high molecular weight compounds and tend to have a higher concentration of PAHs than gasoline and middle distillates. These fuels often contain blending agents including cracked bunker fuel and catalytically cracked clarified oil. Both of these blending agents have been classified as animal carcinogens. Catalytically cracked clarified oil is recognized as one of the most carcinogenic materials in a petroleum refinery. Acute oral effects of exposure to Fuel Oil No. 6 in animals include lethargy, congestion of liver and kidneys, and intestinal irritation. The heavy metals arsenic, lead, and zinc have been detected in samples of Fuel Oil Nos. 4 and 6.

TOXICITY OF USED OILS

Used oils are the byproduct of using oil as a lubricant. Through this use, the oils pick up a number of substances, such as lead, chromium, cadmium, and chlorinated solvents which are hazardous to human health. Analysis also indicates that PCBs contaminate 18 percent of used oils.

Automotive used oils tend to have a higher concentration of heavy metals, while industrial used oils tend to have a higher concentration of chlorinated solvents and PCBs.

No differences in the concentration of aromatic solvents or PAHs were found.

TOXICITY: USED OILS

- Composition varies: may include lead, chromium, cadmium, chlorinated solvents
- PCBs detected in 18 percent of analyses
- Automotive used oils: higher concentrations of heavy metals
- Industrial used oils: higher concentration of chlorinated solvents and PCBs
- No difference in concentration of aromatic solvents or PAHs

Heavy metals typically found in used oil include:

- Lead
 - Pre-1980 stock up 20,000 ppm
 - 1980s stock 100 1,200 ppm
- Barium 50 to 500 ppm (4,000 ppm)
- Cadmium 2 to 10 ppm
- Chromium 3 to 30 ppm
- Arsenic 5 to 25 ppm
- Zinc 100 to 1,220 ppm

Other contaminants include:

- Toluene and xylene 500 to 10,000 ppm
- Benzene 100 to 300 ppm
- Benzo(a)pyrene and benzo(a)anthracene 50 to 1,000 ppm
- Naphthalene 100 to 1,400 ppm

Chlorinated solvents commonly detected in used oil include:

- Dichlorodifluoromethane <1 to 2,200 ppm
- Trichlorotrifluoroethane <20 to 550,000 ppm
- 1,1,1-Trichloroethane <1 to 110,000 ppm
- Trichloroethylene <1 to 40,000 ppm
- Tetrachloroethylene <1 to 32,000 ppm

Table 2-3 (con.)
SUMMARY OF TOXICOLOGICAL EFFECTS

Exposure Potential	Exposure Pathway	Target Organs	Symptoms:	
			Acute	Chronic
Xylenes	Ingestion Inhalation Absorption Placental transfer	Central nervous system, skin, liver, kidneys, gastrointestinal tract, eyes, nose, throat, mucous membranes, placenta	Narcotic effects on the central nervous system, CNS depression at high concentration	Central nervous system excitation followed by depression, tremors, apprehension, irritability, impaired memory, incoordination, fatigue, dizziness, headache, anorexia, sleep disorders
			Irritation of the skin, eyes, nose, throat, and mucous membranes Impaired reaction time, manual coordination, and body balance Nausea, vomiting, abdominal pain, loss of appetite Placental transfer has resulted in incomplete fetal brain development	Variable effects on liver and kidneys, irritant effects on gastrointestinal tract, abdominal pain, nausea, digestive disorders Prolonged skin contact may cause formation of vesicles
Ethylbenzene	Ingestion Inhalation Absorption	Liver, kidney, skin, eyes, upper respiratory tract, lung tissue, and central nervous system	Irritates the skin, eyes, and upper respiratory tract Inhalation of small amounts causes extensive edema and hemorrhage of lung tissues Skin contact may yield inflammation Eye irritation and lacrimation are immediate and severe at 2000 ppm, accompanied by moderate nasal irritation -- tolerance develops after several minutes; CNS effects begin at roughly six minutes At 5000 ppm irritation to eyes, nose and throat is intolerable	Known to be toxic to liver and kidneys Depresses central nervous system Irritation and damage to lung tissue may exacerbate the systems of other obstructive airway diseases
Trimethylbenzenes	Ingestion Inhalation Absorption	Central nervous system, lungs, blood	Nervousness, tension, anxiety, asthmatic bronchitis, hypochromic anemia, and impacts on blood coagulation	Unknown

SUMMARY OF TOXICOLOGICAL EFFECTS

Exposure Potential	Exposure Pathway	Target Organs	Symptoms:	
			Acute	Chronic
Motor Gasoline 54.5% of U.S. Petroleum Market	Ingestion Inhalation Absorption	Lungs, Intestinal organs, Kidneys	Low Exposure: drowsiness, vertigo, vomiting. High Exposure: Unconsciousness, hemorrhaging of lungs and intestines, death	Kidney Damage Probable human carcinogen
Middle Distillate Fuels 32.7% of U.S. Petroleum Market	Ingestion Inhalation Absorption	Central Nervous System, Mucous membranes, skin, eyes, liver kidneys	Headache, nausea, mental confusion, irritation of respiratory tract, skin and mucous membranes. Hemolytic anemia, cardiovascular disturbances	Neurological effects, broncho-pneumonia, toxic effect in cells, hemopoietic system, lymphoid system, and testes. Probable human carcinogen
Residual Oil Fuels 11.7% of U.S. Petroleum Market	Ingestion Inhalation Absorption	Liver, Kidneys, intestines	Oral effects of No. 6 fuel oil in animals include lethargy, congestion of liver and kidneys, and intestinal irritation.	N/A
Constituents: AROMATIC- Benzene 4% of Gasoline (by weight)	Ingestion Inhalation Absorption	Central nervous system, skin, kidneys, bone marrow	Low Exposure: dermatitis, headache, light headedness. High Exposure: dizziness, nausea, vomiting, convulsions, respiratory paralysis, death	Benzene is a known human carcinogen. Anemia, leukemia, and decrease in blood packet count. Severe bone marrow damage resulting in deficiency of all cellular elements of the blood, increased susceptibility to infection and hemorrhagic conditions. Irreversible chromosome damage
Toluene 4-7% of Gasoline (by weight)	Ingestion Inhalation Absorption	Central nervous system, eyes, skin	Muscular fatigue, confusion, tingling skin, euphoria, headache, dizziness, lacrimation, dilated pupils, eye irritation, nausea, insomnia, nervousness, impaired reaction time	Dermatitis Higher reported incidence of menstrual disorders, low birthweight and fetal asphyxia. Incomplete fetal brain development due to placental transfer.

Table 2-3 (con.)
SUMMARY OF TOXICOLOGICAL EFFECTS

Exposure Potential	Exposure Pathway	Target Organs	Symptoms:
ADDITIVES -			
Tetraethyl & Tetramethyl Lead			
	Ingestion Inhalation Absorption	Central nervous system, peripheral nerves, liver, kidney, thymus, human reproductive system, and hematopoietic system	<p>Acute</p> <p>Weakness, fatigue, headache, aprior, tremors, nausea, vomiting, diarrhea, anorexia, weight loss, insomnia, irritability, delirium Peculiar sensation of hair in the mouth, feeling of insects on skin Progressive vegetative disturbances: hypotonia, hypothermia, and bradycardia Higher intoxication: confusion, delirium, manic excitement, and catatonia</p> <p>Chronic</p> <p>Loss of consciousness and death may follow after several days Severe intoxication: recurrent or continuous episodes of disorientation and intensive hyperactivity, rapidly converting to convulsions, terminating in coma or death Death may occur from a combination of CNS depression, respiratory irritation, and bronchiolar obstruction TEL is likely to adversely affect human reproduction and embryonic development</p>
	Ingestion Inhalation Absorption	Central nervous system, liver, kidneys, lungs, eyes, mucous membranes, skin, human reproductive system	<p>Inhalation exposure causes vomiting, diarrhea, abdominal pain, delayed lung damage and CNS depression Vapor is irritating to eyes and mucous membranes Liquid forms are highly irritating to skin resulting in marked erythema and vesiculation Ingestion has led to death Exposure may result in lung, liver, and kidney damage</p> <p>EDB and EDC are highly toxic Both EDB and EDC are identified as carcinogens, although EDC has a much lower potency Exposure causes liver and kidney damage and often results in delayed pulmonary lesions Recent studies by NIOSH have shown adverse male reproductive effects</p>
	Ingestion Inhalation Absorption	Spinal cord, peripheral nervous system	<p>Nausea, vomiting, diarrhea, and abdominal pain</p> <p>Acute symptoms followed by a latent period of 3 to 30 days of muscle soreness, numbness of fingers, calf muscles, and foot stress- ing to foot and wrist ulup Recovery may take months to years; 20-25% of cases never recover</p>

Tri-ortho-cresyl
Phosphate (TOCP)

Table . . . (con.)
SUMMARY OF TOXICOLOGICAL EFFECTS

ALKANES & ALKENES - Hexane	Exposure Potential	Exposure Pathway	Target Organs	Symptoms:	
				Acute	Chronic
11-13% of gasoline (by weight)	Ingestion Inhalation Absorption	Central nervous system, skin, eyes, mucous membranes, (kidneys?)	Initially dizziness, headaches, nausea Pre-narcotic symptoms occur at vapor concentrations of 1500 to 2500 ppm CNS depression yields a narcosis-like state at high concentrations Skin, eye, and mucous membrane irritation observed at fairly 880 ppm for 15 minutes		Nerve damage, initially as numbness in the extremities, increasing to loss of muscular stretching reflexes, eventual paralysis in varying degrees, with neutralized nerve conductivity and cranial nerve involvement in most severe cases Recovery begins 6-12 months after exposure ceases in mild/moderate cases; severe cases may require several years to recover
			Direct aspiration into the lungs may cause rapid death due to cardiac arrest, respiratory paralysis, and asphyxia Narcotic potency similar to heptane	Although narcotic effects can be expected from octane exposure, the CNS effects observed with heptane are not found with octane Prolonged dermal exposure results in blistering and burning effects	
Octane	Ingestion Inhalation Absorption	Central nervous system, lungs, respiratory system, skin	Direct aspiration into the lungs may cause rapid death due to cardiac arrest, respiratory paralysis, and asphyxia Narcotic potency similar to heptane	Although narcotic effects can be expected from octane exposure, the CNS effects observed with heptane are not found with octane Prolonged dermal exposure results in blistering and burning effects	
Isopentane	NA	Central nervous system, skin, eyes	Exhalation, dizziness, headache, nausea, confusion, inability to do fine work, persistent taste of gasoline, loss of consciousness in extreme cases Inhalation of up to 500 ppm appears to have no effect in humans, higher concentrations cause irritation to skin and eyes	Repeated or prolonged skin contact will dry and delat skin resulting in irritation and dermatitis	

SAFETY PLAN PREPARATION

Planning is the most critical element of UST investigations.

- **Anticipate and prevent hazards to minimize risk to workers and the public.**
- **Key to successful site safety = a site health and safety plan.**

SAFETY PLAN PREPARATION

UST investigations require that all operations be planned ahead of time in order to keep problems to a minimum. Anticipating and preventing potential accidents is the best way to protect workers and the public from injury.

The major aspect of planning for any hazardous field activity is the development and implementation of a comprehensive safety plan that considers each specific phase of an operation. This plan identifies all potential hazards, and specifies methods to control these hazards; prescribes work practice, engineering controls and PPE; and defines areas of responsibility.

The plan describes the organizational structure for site operations (most appropriate for use at state-lead cleanup sites) and plans for coordination with existing response organizations including the local fire marshal, police, ambulance, and emergency care facility.

The plan should be prepared by an individual knowledgeable in health and safety and at a minimum, reviewed and approved by personnel knowledgeable in industrial hygiene and health and safety.

SAFETY PLAN PURPOSE

The purpose of a safety plan is to provide guidelines and procedures required to assure the health and safety of those personnel working at sites. While it may be impossible to eliminate all risks associated with site work, the goal is to provide state-of-the-art precautionary and responsive measures aimed at assuring the use of proper occupational health and safety procedures for the protection of on-site personnel, the general public, and the environment.

A written safety plan basically outlines the steps workers should follow when on-site, and eliminates the uncertainties of memory by providing a checklist for inspectors to use when preparing to go on site. Sample checklists are provided in the appendix.

SAFETY PLAN PURPOSE

- **Assures systematic attention to health and safety issues**
- **Specifies procedures to protect on-site personnel, general public, and environment**
- **Eliminates memory uncertainties; provides checklist for on-site activity**

SITE HEALTH AND SAFETY PLANS

SAFETY PLAN HAZARD ASSESSMENT

Most difficult and critical plan element

Should be conducted by knowledgeable individual

Should consider:

- **chemical and physical hazards**
- **environmental conditions**
- **interplay between work activities and hazards**

SAFETY PLAN HAZARD ASSESSMENT

The most difficult and critical aspect of the safety plan is assessing all possible potential hazards that may arise. If possible, the plan should identify all of the potential hazards and describe methods to control them.

Safety is defined as the practical certainty that harm will not occur. A safety plan based on reliable information will reduce the measure of risk by preventing, or at least, minimizing human exposure to hazards. Note that exposure consists of human contact with a hazard. A **hazard** is defined as any substance, situation, or condition that is capable of doing harm to human health, property and/or the environment. Note that this definition does not say that the hazards will do harm, but merely that it has the capability to do so.

The activities required to accurately assess risks and determine their acceptability can be divided into three interacting elements:

- **Recognition:** Identifying the substances, situations or conditions that may be hazardous and the characteristics that determine the degree of hazard.
- **Evaluation:** Comparing the potential impact of the risk to acceptable levels of impact or risk.

SAFETY PLAN HAZARD ASSESSMENT

- **Control:** Instituting methods to eliminate or reduce the impact of the potential hazards.

The **risk** associated with a potential hazard is defined as the probability of harm to human health, property or the environment. Inspectors need to plan for effective control of both physical and health hazards often encountered at UST facilities. Inspectors are strongly encouraged to use site-specific checklists to ensure control of potential hazards.

While on-site, hazardous conditions may be in a continuous state of flux (particularly vapor-related hazards). As new monitoring results become available, inspectors should evaluate the relative risk on-site and if necessary, make adjustments in work practices or PPE.

SAFETY PLAN CONTENTS

- **Expected field activities**
- **Potential hazards and control guidelines**
- **Work practices and engineering controls**
- **Monitoring and protective equipment required**
- **Personnel roles and responsibilities**
- **Emergency procedures and contacts**

SAFETY PLAN CONTENTS

NOTES

The safety plan is intended to:

- Provide a systematic consideration of health and safety issues in the preparation and execution of site work and enhance the ability of team members to use their best professional judgement in reducing hazards.
- Describe potential hazards and specify applicable guidelines, standards, and regulations, and appropriate emergency responses to such hazards.
- Prescribe work practices, engineering controls, and personal protection to protect team members.
- Prescribe monitoring equipment to detect and measure potential exposures to hazardous substances.
- Prescribe guidance for changing work practices and personal protection levels in response to changing site conditions.
- Provide a list of emergency contacts.

A sample safety plan is provided in the appendix for your information.

HANDLING EMERGENCIES

- Identify/confirm off-site emergency services and capabilities.
- Define job evacuation procedures for workers (audible warning signals, etc.).
- Prepare list of emergency equipment available on-site.

HANDLING EMERGENCIES

NOTES

The site specific checklists in the safety plan should identify all nearby emergency services, including fire and rescue services, hospitals, ambulances, medivacs, police departments, public health departments, explosives experts, and hazardous materials response teams.

The checklists should also include a list of emergency equipment available on-site. At a minimum, the checklists should include the following:

- A list of emergency service organizations that may be needed. Arrangements for using emergency organizations should be made prior to the initiation of site activities. Evaluate their capability to handle the sort of emergencies that might occur.
- A list of emergency equipment. This list should include emergency equipment available on site, as well as transportation, fire fighting and equipment to mitigate emergencies, for example, booms and sorbents.
- A list of utility company contacts, such as power, electrical, gas, and telephone.

SITE HEALTH AND SAFETY PLAN FOR UNDERGROUND STORAGE TANK INSPECTIONS

The following is a generic site health and safety plan for underground storage tank inspections. As indicated throughout the plan, selected sections should only be filled out by people with technical expertise in health and safety issues. In addition, State organizations using this plan should set up a system to ensure that: (1) the plan is used properly and (2) staff follow proper safety procedures.

PART I

Part I (Sections I-IV) should be completed by the UST inspector prior to the site visit.

SECTION I. GENERAL SITE INFORMATION

SITE NAME AND ADDRESS:

CONTACT PERSON AND PHONE NUMBER:

SITE IDENTIFICATION NUMBER:

PROPOSED DATE(S) OF SITE WORK:

SECTION II. DESCRIPTION OF INSPECTION ACTIVITY

PURPOSE OF ACTIVITY:

New Tank Installation	()
Tank Closure	()
Tank/Pipe Removal	()
Tank/Pipe Disposal	()
Petroleum Release Investigation	()
Tank/Pipe Repair	()
Leak Detection Testing	()
Installation of Monitor Wells/Sampling	()

PROVIDE A BRIEF NARRATIVE DESCRIPTION OF THE PROPOSED INSPECTION ACTIVITIES:

SECTION III. SPECIFIC SITE INFORMATION

SPECIFIC TANK SYSTEM INFORMATION:

Age/Size Capacity of Tanks and Piping:

Contents of Tank:

Other (Specify):

TYPE OF SITE

CHECK ALL APPROPRIATE:

- | | |
|--|--|
| <input type="checkbox"/> Active | <input type="checkbox"/> TSDf |
| <input type="checkbox"/> Inactive | <input type="checkbox"/> R & D Facility |
| <input type="checkbox"/> Industrial facility | <input type="checkbox"/> Military base |
| <input type="checkbox"/> Gas station | <input type="checkbox"/> Other (Specify) |

RELEASE HISTORY

- No evidence of leaks soil contamination ()
- Suspected or known leaks and soil contamination ()
- Known groundwater contamination ()

BACKGROUND AND DESCRIPTION OF ANY PREVIOUS INVESTIGATIONS OR INCIDENCE:

BACKGROUND INFORMATION STATUS: () COMPLETE () INCOMPLETE

SECTION IV. POTENTIAL HEALTH AND SAFETY HAZARDS

ANTICIPATED PHYSICAL HAZARDS OF CONCERN: (CHECK ALL THAT APPLY AND DESCRIBE)

- | | |
|--|---|
| <input type="checkbox"/> Heat (high ambient temp.) | <input type="checkbox"/> Heavy equipment |
| <input type="checkbox"/> Cold | <input type="checkbox"/> Physical injury and trauma resulting from moving machinery |
| <input type="checkbox"/> Noise | |
| <input type="checkbox"/> Oxygen depletion | |
| <input type="checkbox"/> Asphyxiation | |
| <input type="checkbox"/> Excavation | <input type="checkbox"/> General construction |
| <input type="checkbox"/> Cave-ins | <input type="checkbox"/> Physical injury and trauma |
| <input type="checkbox"/> Falls, trips, slipping | <input type="checkbox"/> Electrical Hazards |
| <input type="checkbox"/> Handling and transfer of petroleum products | <input type="checkbox"/> Confined space entry |
| <input type="checkbox"/> Fire | <input type="checkbox"/> Explosions |
| <input type="checkbox"/> Explosions | <input type="checkbox"/> Other (Specify) |

ANTICIPATED BIOLOGICAL HAZARDS: (LIST BELOW)

- Snakes
- Insects
- Rodents

- Poisonous plants
- Other

NARRATIVE: (Provide all information which could impact Health and Safety -- e.g., power lines, integrity of dikes, terrain, etc.)

ANTICIPATED CHEMICAL HAZARDS: (LIST BELOW ALL CHEMICALS PRESENT ON SITE; ATTACH MATERIAL SAFETY DATA SHEETS-MSDS)

- 1.
 - 2.
 - 3.
 - 4.
 - 5.
 - 6.
 - 7.
 - 8.
 - 9.
 - 10.
-

PART II

Section V should only be completed by persons with technical expertise in health and safety.

SECTION V. EVALUATION OF POTENTIAL HAZARDS

CHEMICALS OF CONCERN

<u>Chemical</u>	Highest Observable Concentration (media)	PEL/ TLV	IDLH	Symptoms/ Effects of <u>Acute Exposure</u>
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PART III

Sections VI and VII should be completed by the UST inspector prior to the site visit.

SECTION VI. METHODS TO CONTROL POTENTIAL HEALTH AND SAFETY HAZARDS

MONITORING INSTRUMENTATION: (NOTE: MONITORING INSTRUMENTS MUST BE USED FOR ALL OPERATIONS UNLESS APPROPRIATE RATIONALE OR RESTRICTIONS ARE PROVIDED).

- Organic Vapor Analyzer
 - Photoionization Detector
 - Combustible Gas Indicator (CGI)
 - Oxygen Meter
 - Hydrogen Sulfide Meter
 - Detector Tubes (specify)
 - Other, specify (toxic gas, air sampling pumps, etc.)
-

IF MONITORING INSTRUMENTS ARE NOT USED, SPECIFY RATIONALE OR JUSTIFICATION OR ACTIVITY/AREA RESTRICTIONS.

ACTION LEVELS (breathing zone):

Combustible Gas Indicator

- | | | |
|---------|-----|---|
| 0 - 10% | LEL | No Explosion Hazard |
| 10 -25% | LEL | Potential Explosion Hazard; Notify Site Health and Safety Officer |
| >25% | LEL | Explosion Hazard; Interrupt Task/Evacuate |

ACTION LEVELS (breathing zone): continued

Oxygen Meter

<21.0%	O ₂	Oxygen Normal
<21.0%	O ₂	Oxygen Deficient; Notify Site Health and Safety Officer
<19.5%	O ₂	Oxygen Deficient; Interrupt Task/Evacuate

Photoionization Detector Specify:

- () 11.7 ev
- () 10.2 ev
- () 9.8 ev

Type:

Flame Ionization Detector Specify:

Type:

Detector Tubes Specify:

Type

Type

Type

PERSONAL PROTECTIVE EQUIPMENT: List all applicable items

Minimum personal protective equipment:

1. Hardhat
2. Safety glasses/goggles
3. Steel toed/shank shoes or boots
4. Flame retardant coveralls
5. Hearing protection (muffs or ear plugs)

Is additional PPE required?

YES / NO

