A Report to
U.S. Environmental
Protection Agency

DRAFT REPORT

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Applicability of Environmental Auditing To Underground Storage Tanks

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DISCLAIMER

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SECTION 1

INTRODUCTION

1.1 BACKGROUND

On 8 November 1985, EPA issued an Environmental Auditing Policy Statement (Federal Register 50, No. 217, 8 November 1985, 46504-8) that encouraged regulated firms to set up audit programs. The Policy Statement stopped short of explicitly offering less enforcement oversight, fast-track permitting, and fewer inspections for these firms. In encouraging the development of audit programs, the Agency is continuing the implementation of a 1982 informal, three-pronged policy of endorsement, analysis, and assistance.

EPA has endorsed environmental auditing: by producing, compiling, and disseminating audit-related literature; by speaking about auditing at workshops and conferences; and by continuing to communicate with an expanding network of interested professionals, trade associations, and state agencies. The Agency has analyzed the various factors affecting compliance management and auditing, the characteristics of effective audit programs, and the benefits of auditing to the regulated community and the environment. Finally, EPA has assisted interested states and Federal agencies seeking to propose more-specific auditing approaches.

This report is part of EPA's program of providing technical assistance and public information to support environmental auditing. In this instance, the issue addressed is the use of auditing to promote compliance with underground storage tank regulations.

On 8 November 1984, President Regan signed into law the Hazardous and Solid Waste Amendments (HSWA). Subtitle I of the HSWA established requirements for development of a new program to regulate underground storage of petroleum products and hazardous substances. Even with active state and local involvement, the regulation of an estimated 1.2 million tanks governed by this program is a challenge which cannot be adequately met by regulatory agency enforcement and inspection activities. Environmental auditing can improve compliance by complementing regulatory agency oversight activities.

1.2 SUMMARY

The remainder of this report is divided into two sections. Section 2 is a review of recent regulatory initiatives and trends. The review indicates that there is a great deal of regulatory activity related to underground storage tanks at the Federal, state, and local levels. Unlike some Federal programs, the Federal UST program encourages states to develop their own programs without waiting for the passage of Federal regulations. As a result, existing programs vary widely in terms of scope, types of tanks and substances regulated, and, technical standards for tank design and lead detection systems. Subtitle I of HSWA provides for flexibility in the authorization of state programs, which means that a wide variety of tank assessment techniques are likely to remain in use for some time to come.

Section 3 is a review of underground storage tank assessment and auditing techniques. As shown in Table 1-1, assessment techniques include a wide variety of mechanisms designed to monitor for, prevent, and/or mitigate leaks. Major classes of assessment techniques are as follows:

- Data Management Systems
- Tank evaluation systems
- Prevention Systems
- Release reporting/corective action
- Tank closure.

Federal, state and local regulations and good management practices can require the use of one or many of the techniques described in Section 3.

Environmental audits would be used to review both the underground tank and the systems put in place to monitor, prevent, or mitigate leaks. Audit techniques can include the use of inquiry, records review, testing, and observation.

In Section 3, for each assessment technique, there is a discussion of how an auditor could determine whether the technique was installed properly, is used properly, and whether the resultant data on tank integrity is evaluated and acted upon properly. These proposed audit approaches can be incorporated directly into an existing audit program but the approaches must be tailored to meet (1) the type of tank, (2) the type of in-place assessment techniques, (3) the form of the checklists used for the current audit program, and (4) corporate or institutional policy.

Table 1-1

Summary of Auditing Procedures Applicable to Tank Assessment and Management Systems

Tank Assessment and Management Systems	Auditing Procedures: Inquiry			Records Review							Testing			Observation			
	Owner/Operator	Manufacturer	Regulatory Agencies	Notification Forms	Permits	Leak Detection	Inspection/Calibration	Tank Testing	Training	Incident Reports	Leak Detection	Calibration Systems	Alarms/Shutoff	Leak Detection	Tank Testing	Site Conditions	Access/Security
Data Management System	X			X	X	X	X	X	X	X							
Tank System Evaluation																	
Manual Inventory Control	X					X				X				X			
Automatic Inventory Control	X	X				X	X			X	X	X	X	X			X
Tank Testing	X	X						X	X	X					X	X	X
Site Inspection	X									X				X		X	X
Groundwater Monitoring	X				X					X							X
External Monitoring	X						X			X							X
Secondary Containment	X					X	X			X	X	X	X	X		X	X
Pipeline Leak Detectors	X	X				X	X			X	X	X	X	X			X
Prevention Systems																	
Existing Tank Retrofit																	
- Cathodic Protection	X						X		X			X				X	X
- Lining/Relining	X	X							X							X	
- Mandatory Retirement	X			X	X												
- Overfill Protection	X						X					X	X			X	X
New Tanks																	
- Design	X	X			X											X	
- Installation		X			X			X	X							X	
- Overfill Protection	X				X		X					X	X			X	X
Release Reporting/ Corrective Action																	
Release Reporting	X			X						X							
Corrective Action	X	X							X	X						X	
Tank Closure																	
Temporary	X			X		X	X	X								X	
Permanent	X			X												X	
Abandoned Tanks	X			X												X	

SECTION 2

A REVIEW OF RECENT REGULATORY INITIATIVES

2.1 INTRODUCTION

Section 2 indicates that federal, state, and local regulations governing underground storage tanks vary widely in terms of the types of tanks and substances regulated, as well as in requirements for new and existing tanks. The current federal regulatory trend is toward development of a single set of technical standards governing all tanks and all regulated substances, with emphasis on broad, performance-oriented regulations. In contrast to some federal regulatory initiatives, the federal UST program is designed to encourage states to develop their own programs as soon as possible, without waiting for passage of federal regulations. Flexibility in the authorization of state programs is provided to encourage state action. As a result, a wide variety of tank assessment techniques is likely to remain in use for some time to come. Existing federal, state, and local regulations and recent regulatory trends are summarized below.

2.2 FEDERAL REGULATORY INITIATIVES

2.2.1 Introduction

On 8 November 1984 President Reagan signed into law the Hazardous and Solid Waste Amendments of 1984 (Public Law 98-616). Title VI of this statute establishes a new subtitle to the Solid Waste Disposal Act (usually referred to by the name given to the 1976 Amendments, the Resource Conservation and Recovery Act) which mandates that the Environmental Protection Agency develop a program to regulate the underground storage of petroleum and chemical products. A section of this law has a direct effect on petroleum storage tanks. The requirements of this law are found in Subtitle I, Section 9000 through 9010. Key sections are described below.

2.2.2 Existing Regulations: Key Requirements of Subtitle I

Definitions and Exemptions, Section 9001

Section 9001 defines "underground storage tank" as a tank or combination of tanks (including underground pipes which are connected to such tanks) which is used to contain regulated substances and is 10 percent or more beneath the surface of the ground. The volume of the underground pipes must be included in the calculation of the 10 percent threshold. The definition of underground tanks does not include any:

- Farm or residental tank of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes.
- Tank used for storing heating oil for consumptive use on the premises where stored.
- Septic tank.
- Pipeline facility (including gathering lines) regulated under a number of existing federal laws.
- Surface impoundment, pit, pond, or lagoon.
- Storm water or wastewater collection systems.
- Flow-through process tank.
- Liquid trap or associated gathering lines directly related to oil or gas production and gathering operations.
- Storage tank situated in an underground area (such as a basement, cellar, or mineworking drift, shaft, or tunnel) if the storage tank is situated on or above the surface of the floor.

The term "regulated substance" means any petroleum, or any petroleum product, or any hazardous substance as defined in Section 101(14) of Superfund, but not a listed or identified hazardous waste under Subtitle C of RCRA.

Notification, Section 9002

Not later than 8 May 1986 each owner of an underground storage tank must notify the designated state or local agency of the existence of his tank. The notification, which is to be provided on a form prescribed by the EPA Administrator, must specify the age, size, type, location, and use of each tank. The same information must be provided (within 30 days of installation) for any tank brought into operation after 8 April 1986.

For each tank taken out of operation after 1 January 1974, the owner must provide notice of the existence of the tank (unless the owner knows the tank was subsequently removed from the ground) and the date the tank was taken out of operation. The notice must also specify the age of the tank when it was taken out of operation, the size, type, and location of the tank and the type and quantity of any substances left in the tank.

In addition, beginning 30 days after the Administrator prescribes the form of notice (and for 18 months thereafter) anyone who deposits regulated substances in an underground storage tank shall notify the owner or operator of the notification requirements. Beginning 30 days after the Administrator issues new tank performance standards, anyone who sells a tank (for use as an underground storage tank) must notify the purchaser of the notification requirements.

Release Detection, Prevention, and Correction Reguations, Section 9003

Section 9003 requires the Administrator to promulgate release detection, prevention, and correction regulations as may be necessary to protect human health and the environment. These regulations must include (but need not be limited to) requirements for:

- Maintaining a leak detection system, an inventory control system together with tank testing, or a comparable system or method designed to identify releases in a manner consistent with the protection of human health and the environment.

- Maintaining records of any monitoring or leak detection system or inventory control system or tank testing system.

- Reporting of any releases and corrective action taken in response to a release from an underground storage tank.

- Taking corrective action in response to a release from an underground storage tank.

- The closure of tanks to prevent future releases of regulated substances into the environment.

- Maintaining evidence of financial responsibility for taking corrective action and compensating third parties for bodily injury and property damage caused by sudden and nonsudden accidential releases arising from operating an underground storage tank.

- Standards of performance for new underground storage tanks.

In promulgating these regulations, the Administrator is permitted to distinguish between types, classes, and ages of underground storage tanks. In making such distinctions, the Administrator may take into consideration factors, including, but not limited to location of the tanks; soil and climate conditions; uses of the tanks; history of maintenance; age of the tanks; current industry recommended practices; national consensus codes; hydrogeology; water table; size of the tanks; quantity of regulated substances periodically deposited in or dispensed from the tank; technical capability of the owners and operators; and the compatibility of the regulated substance and the materials of which the tank is fabricated.

In developing the regulations for new tanks, the Administrator must establish standards concerning release detection and design, construction, and installation of the tanks, as well as the compatibility of the tanks to the materials that are stored.

The Administrator may also promulgate regulations requiring owners and operators to maintain "evidence of financial responsibility" (e.g., insurance) for taking corrective action and compensating third parties for bodily injury and property damage caused by sudden and nonsudden accidental releases.

By 8 February 1987 the Administrator must promulgate the leak detection, prevention, and correction regulations for tanks containing petroleum products. The same deadline applies to regulations for new tank performance standards.

By 8 August 1987 the Administrator must promulgate performance standards for new tanks designed to store hazardous substances. One year later the Administrator must promulgate regulations for existing tanks containing hazardous substances.

In each case, the regulations take effect three months after promulgation.

Section 9003 also requires that beginning 7 May 1985 no underground storage tank may be brought into use unless the tank will prevent releases due to corrosion or structural failure during the operational life of the tank; and is cathodically protected, is constructed of a noncorrosive material (such as fiberglass), is clad with a noncorrosive material, or is designed to prevent the release of the stored substance. In addition, the material used in the construction or lining of the tank must be compatible with the substance to be stored.

The interim prohibition does not apply if the tank is installed in soil whose resistivity is 12,000 ohms/centimeter or greater.

To date, EPA has issued final regulations governing tank notification requirements and final regulations governing the interim prohibition on bare steel tanks.

Approval of State Programs, Section 9004

A key element of Subtitle I is the provision which allows states to administer and enforce the underground storage tank program in lieu of EPA. To qualify as an approved program, a state's regulations must be "no less stringent" than the Administrator's and must include the requirements for new tank performance standards, as well as the release detection, prevention, and correction standards for existing tanks.

Inspections, Monitoring, and Testing, Section 9005

In order to assist the Administrator in developing and enforcing underground tank regulations, Section 9005 provides that owners and operators shall provide, on request, information relating to their tanks and associated equipment, as well as all relevant records. In addition, EPA officials (or representatives of a state with an approved program) are authorized to:

- Enter at reasonable times any establishment or other place where an underground storage tank is located.

- Inspect and obtain samples from any person of any regulated substances contained in such tank.

- Conduct monitoring or testing of the tanks, associated equipment, contents, or surrounding soils, air, surface water, or groundwater.

Federal Enforcement, Section 9006

Section 9006 authorizes the Administrator to issue orders requiring compliance with any requirements that he determines are being violated. Failure to comply may result in a civil penalty.

Other Requirements, Section 9007 - 9010

The remaining sections of the Act govern:

- Applicability of the program to federal facilities, Section 9007.

- Ability of states and local authorities to adopt more stringent regulations, Section 9008.

- UST studies to be performed, Section 9009.

- Authorization of appropriations, Section 9010.

2.2.3 Federal Regulatory Trends

To date, EPA has issued final regulations governing tank notification requirements and final regulations governing the interim prohibition on bare steel tanks.

New federal regulations governing underground storage tanks will be promulgated over the next several years. At the present time, it appears the federal program will encompass the following elements:

- Flexible approach to authorization of state UST programs, in order to encourage states to develop UST programs as soon as possible.

- Emphasis on broad, performance-oriented tank technical standards in order to accommodate continuing development of leak detection technologies.

- Development of technical standards for all tanks and all regulated substances through one regulatory process.

- Development of regulations for new and existing petroleum tanks on the same schedule as those for hazardous substance tanks (despite legislative provisions for a phased schedule).

- Tailoring the UST program to EPA's groundwater protection strategy by adopted baseline standards for all tanks with additional requirements for tanks in Class I (vulnerable) aquifers and exemptions available for tanks in Class III (limited use) aquifers.

2.2.4 Relationship to Other EPA Tank Regulations

Subtitle I of RCRA, which establishes the UST program, specifically excludes hazardous waste storage and treatment tanks. Hazardous waste tanks are governed by Subtitle C of RCRA. The approaches to regulating the two types of tanks differ greatly.

EPA's existing regulations for (above- and below-ground) hazardous waste tanks were promulgated in 1980 and 1981. Interim status standards for the storage and treatment of hazardous wastes in tanks were promulgated in May 1980 and are contained in 40 CFR 265, Subpart J. These standards focus on operational measures designed to prevent releases from tanks.

RCRA permitting standards for tanks which can be entered for inspection were promulgated in January 1981 and are contained in 40 CFR 264, Subpart J. These standards emphasize structural integrity of tanks to protect against rupture, leaks, and collapse.

Several elements are not addressed in the existing hazardous waste tank regulations. First, a secondary containment standard is not included. Secondly, existing permitting standards contained in 40 CFR 264 address only tanks which can be entered for inspection. Underground tanks which cannot be entered for inspection are not addressed. Finally, existing standards do not require corrosion protection for steel tanks exposed to corrosion-inducing soils.

As a result, EPA proposed new regulations to address additional aspects of hazardous waste tank management in June 1985 (50 FR 26444-26504). These regulations have not been finalized.

The proposed hazardous waste tank regulations are compared to the UST regulations in Table 2-1. Significant differences include:

- Permit requirement for hazardous waste tanks; no permit for UST.
- Groundwater monitoring and secondary containment are main features of the hazardous waste tank regulations and are only two of several options under consideration for UST.
- The proposed UST regulations appear to be leading toward an emphasis on improved tank designs without secondary containment.

These inconsistencies can be explained by:

- Differences in statutory language.
- Differences in the size of the regulated community. (Approximately 1,547 underground hazardous waste tanks exist today, as compared to more than 1.2 million UST.)
- Possible differences in management practices and tank system design.

In short, the statutory language and proposed regulations governing the two types of tanks differ significantly. The two regulatory approaches will have to be explained based on the differences in the tank systems, tank management practices, and number of tanks regulated under the two programs. Otherwise, one of the two regulatory approaches will have to be changed to resolve inconsistencies.

2.2.5 Authorization of State Programs

Regulation of more than 1.2 million tanks is a complex task which clearly requires state and local involvement in implementation and enforcement. The federal approach to UST regulation is to encourage states to develop their own programs as soon as possible, without waiting for the final federal regulations. The federal approach to authorization of state programs is therefore flexible in order to accommodate individual state initiatives.

Table 2-1

Comparison of Proposed Federal Hazardous Waste Tank Regulations and Existing Federal UST Regulations

Type of Tank	Containment Requirements	
	Existing Tanks	New Tanks
Hazardous waste storage/treatment tanks (RCRA permit required; proposed 40 CFR 264-265)	Within one year of effective date: -Full secondary containment or -Leak testing every 6 months and groundwater monitoring[1]	Full secondary containment
Hazardous waste "less than 90-day" accumulation tanks (No RCRA permit; proposed 40 CFR 262.34)	Within one year of effective date: -Full secondary containment or -Apply for Part 264 permit	Full secondary containment
UST (40 CFR 280)	No requirements at present	Emphasis on improved tank designs (e.g., corrosion-resistant tanks compatible with product stored) without secondary containment

[1]Applies to existing underground tanks. Existing inground tanks (those partially above ground) require full secondary containment or partial secondary containment and groundwater monitoring.

Beginning in May 1987, states may seek federal authorization to operate and enforce their UST programs in lieu of the federal program. States must demonstrate that their programs contain the major elements of the federal program and provide for adequate enforcement of these elements.

States may apply for authorization for tanks containing petroleum, tanks containing other regulated substances, or both. To obtain authorization, the state's program must be no less stringent than the federal program. However, RCRA provides a 1- to 2-year grace period to make it easier for the state to satisfy the "as stringent" requirement. The objective is to encourage states to proceed to establish UST programs and not wait until federal regulations are developed.

Section 9008 of RCRA allows states and local governments to adopt regulations which are more stringent than those contained in the federal program. In fact, many state and local agencies have already adopted more stringent regulations, as described in Subsection 2.2.

Section 9004 of RCRA, which governs state authorization, can be interpreted in several ways. However, it appears that a state program may be authorized during the initial grace period if the state has legislative authority as stringent as the federal law in four major areas: corrective action, financial responsibility, performance standards for new tanks, and notification system, and if the state proceeds to fill gaps in legislation or regulations after the federal program is established.

EPA may withdraw authorzation and reinstitute the federal program if it holds a public hearing and finds that a state is not administrating and enforcing a program appropriately.

2.3 STATE REGULATORY INITIATIVES

2.3.1 Introduction

Many states had regulations governing the storage of hazardous materials underground long before the passage of the 1984 RCRA amendments. For the most part, these regulations were based on the National Fire Protection Association (NFPA) standards or Uniform Fire Code (UFC) standards governing the safe storage of flammable materials underground. However, the scope of the regulations varied widely. Some states regulated all hazardous materials, while others covered only the storage of flammable materials. Some states have adopted only fire safety standards, while others included leak detection system requirements. A few required overfill protection and tank repair/replacement.

The American Petroleum Institute (API) conducted a brief survey in June/July 1985 to gauge the level of activity relating to the development of comprehensive state underground storage tank regulations following passage of the 1984 RCRA amendments. The survey indicated a high level of interest in the development of comprehensive state regulations. A number of states have introduced or enacted legislation on the subject in the last year.

A summary of state regulatory activity related to UST is provided in Table 2-2. The first column summarizes state activity related to development of comprehensive UST regulations. This information is based on the June/July 1985 survey conducted by API, which has been updated based on conversations with selected regulatory agencies and regulatory updates contained in The Tulsa Letter.

Column two was derived from an April 1984 study performed for the U.S. EPA, OPA, which compared state pre-UST regulations to the NFPA and USC standards. This information is provided to give the reader an indication of the scope of existing tank regulations in states which have not initiated a comprehensive UST program.

Column 3 summarizes the status of state petroleum leak cleanup programs. This information was also obtained from a 1985 API survey, which was included in Options Paper for the Underground Storage Tank Technical Standards, prepared for U.S. EPA, OSWER, in August 1985. Those states with asterisks have been selected for further analysis.

Table 2-2

Status of State UST Regulations

State	Comprehensive UST Program[1]	NFPA/USC-Based Program[2]	Leak Cleanup Program[3]
AL	None	None	None
AK	None	None	None
AZ	None	Equal to UFC	Existing-HW and petroleum
AR	None	More stringent	Existing-HW and petroleum
*CA	Regulations existing	Legislation only	Existing-HW and petroleum
CO	None	More stringent	None
*CN	Regulations pending	More stringent	Existing-HW and petroleum
DE	Legislation existing	More stringent	Existing-HW and petroleum
*FL	Regulations existing	More stringent	Existing-HW and petroleum
GA	Legislation pending	More stringent	None
HI	None	None	None
ID	None	Equal to UFC	Proposed-HW and petroleum
IL	Legislation pending	More stringent	Existing-HW Proposed-petroleum

[1]Source: API Survey-June/July 1985.
[2]Source: U.S. EPA, OPA, Review of Underground Storage Regulations, April 1984.
[3]Source: U.S. EPA, OSWER, Options Paper for the Underground Storage Tank Technical Standards, August 1985.
*Selected for further analysis.

Table 2-2
(continued)

State	Comprehensive UST Program[1]	NFPA/USC-Based Program[2]	Leak Cleanup Program[3]
IN	None	More stringent	None
IA	Regulations pending	Equal to NFPA	Existing-HW and petroleum
*KS	Regulations existing	More stringent	Existing-HW and petroleum
KY	None	Equal to NFPA	Existing-HW Proposed-Petroleum
LA	Legislation existing	Equal to NFPA	None
ME	Legislation existing	Equal to NFPA	Existing-petroleum in state waters
*MD	Legislation and regulations existing	More stringent	Existing-petroleum in state waters
MA	Regulations pending	More stringent	Existing-HW and petroleum
MI	Regulations pending	More stringent	Existing-HW and petroleum
MN	Legislation pending	More stringent	Existing-HW and petroleum
MS	None	None	Existing-HW and petroleum
MO	None	None	Existing-HW and petroleum

[1]Source: API Survey-June/July 1985.
[2]Source: U.S. EPA, OPA, Review of Underground Storage Regulations, April 1984.
[3]Source: U.S. EPA, OSWER, Options Paper for the Underground Storage Tank Technical Standards, August 1985.
*Selected for further analysis.

Table 2-2
(continued)

State	Comprehensive UST Program[1]	NFPA/USC-Based Program[2]	Leak Cleanup Program[3]
MT	Legislation pending	Equal to UFC	None
NB	Legislation pending	None	None
NV	None	Equal to UFC	None
*NH	Regulations existing	None	Existing-petroleum
NJ	Legislation pending	Legislation pending	Existing-HW and petroleum
NM	None	None	Existing-HW and petroleum
NY	Legislation pending	Legislation only	Existing-HW and petroleum
NC	Legislation pending	None	Existing-HW and petroleum
ND	None	None	None
OH	None	More stringent	Existing-petroleum Proposed-HW and petroleum
OK	None	Equal to NFPA	None
OR	Legislation pending	None	Proposed-HW and petroleum

[1]Source: API Survey-June/July 1985.
[2]Source: U.S. EPA, OPA, Review of Underground Storage Regulations, April 1984.
[3]Source: U.S. EPA, OSWER, Options Paper for the Underground Storage Tank Technical Standards, August 1985.
*Selected for further analysis.

Table 2-2
(continued)

State	Comprehensive UST Program[1]	NFPA/USC-Based Program[2]	Leak Cleanup Program[3]
PA	Regulations pending	More stringent	None
*RI	Regulations existing	Legislation only	Existing-HW and petroleum
SC	Legislation pending	None	Existing-HW and petroleum
SD	Legislation existing	Equal to UFC	Existing-HW and petroleum
TN	None	Equal to NFPA	Existing-HW and petroleum
TX	None	More stringent	None
UT	None	None	Existing-HW and petroleum
VT	Legislation existing	Equal to NFPA	Existing-HW and petroleum
VA	None	None	Existing-HW and petroleum
WA	Legislation pending	None	Proposed-HW and petroleum
WV	None	Equal to NFPA	None
WI	None	More stringent	Existing-HW and petroleum
WY	Legislation pending	None	None

[1]Source: API Survey-June/July 1985.
[2]Source: U.S. EPA, OPA, Review of Underground Storage Regulations, April 1984.
[3]Source: U.S. EPA, OSWER, Options Paper for the Underground Storage Tank Technical Standards, August 1985.
*Selected for further analysis.

2.3.2 Existing State Tank Regulations

Seven comprehensive state UST programs were selected for detailed evaluation and comparison. The states selected for comparison include: California, Connecticut, Florida, Kansas, Maryland, New Hampshire, and Rhode Island. The general requirements, existing tank requirements, and new tank standards for the seven states are briefly summarized in Tables 2-3, 2-4, and 2-5, respectively. The scope and approach for the seven programs vary greatly. Significant discrepancies are noted below.

General Requirements - Table 2-3

- Only two of seven states regulate both oil and hazardous material storage (California and Rhode Island).

- Three states regulate above-ground and under-ground storage tanks (Florida, Kansas, and Maryland). Exemptions for tanks vary among the states.

State approaches to interaction between the government and tank owners vary. Florida established standards which are assured by enforcement and inspection. Several states require plans be submitted to the state for review and approval (Kansas, New Hampshire, and Rhode Island). Three states require tank permits be obtained (California, Maryland, and New Hampshire).

Existing Tank Requirements - Table 2-4

- Inventory control is required in most states, except those with more stringent monitoring requirements (California, Florida, and Rhode Island).

- Leak detection requirements vary greatly in terms of methodology and frequency.

- Several states have retrofit requirements. In most instances, retrofit is required for leaking tanks only. In contrast, Florida has established a phased tank program for upgrading all existing tanks to new tank standards by 1999.

- Mandatory retirement of tanks past a certain age is required in two states (Connecticut and New Hampshire).

Table 2-3

Comparison of Seven Comprehensive State UST Programs
-- General Requirements

State UST Program	Substances Regulated	Tanks Regulated	Exemptions	Permit Requirements
1. California (Regulations adopted 1/85)	Petroleum and hazardous substances	Underground tanks no size limit	Specified agricultural tanks and hazardous waste tanks (except waste ore)	New tanks only
2. Connecticut (Regulations adopted 11/85)	Petroleum only	Underground tanks no size limit	Commercial and industrial fuel oil tanks 2,100 gallon capacity	None
2. Florida (Regulations adopted 5/84)	Petroleum (for vehicle fueling)	Above-ground and under-ground tanks 550 gallons capacity	Facilities using less than 1,000 gal/mo or 10,000 gal/yr Liquid petroleum and new large petroleum facilities	None
4. Kansas (Regulations implemented 5/84)	Petroleum products	Above-ground and under-ground tanks	Farm tanks; portable or skid-mounted tanks; surface stock tanks for crude oil	None
5. Maryland (Regulations proposed 9/84)	Oil, petroleum products, and their byproducts (including used ore)	Above-ground and under-ground tanks	Storage facilities for single family residence and personal use	Yes
6. New Hampshire (Regulations proposed 2/85)	Oil storage facilities	Under-ground storage tanks	- Tanks 1,100 gallons - Oil production and oil transmission facilities	Yes
7. Rhode Island (Regulations effective 5/85)	Petroleum products and hazardous materials	Under-ground storage tanks	No. 2 fuel oil and jet propulsion fuel (JP-1) tanks	Registration of new and existing tanks

Table 2-4

Comparison of Seven Comprehensive State UST Programs
-- Existing Tank Requirements

	State UST Program	Leak Detection	Repair, Relining, Retrofit	Mandatory Retirement
1.	California (Regulations adopted 1/85)	- Inventory control for motor fuel tanks - Visual monitoring when feasible - Monitoring of all tanks; alternatives and frequency specified	- Tank relining allowed - Retrofit requirement for monitoring system	- Repair allowed as alternative to retirement
2.	Connecticut (Regulations adopted 11/85)	- Inventory control daily - all tanks - Leak detection not required - State may stipulate groundwater monitoring	- Routine tank testing at beginning and end of expected life (starting at year 2)	- Mandatory retirement at end of life expectancy or if unrepairable - Average life expectancy 15 years (5 year extension granted)
2.	Florida (Regulations adopted 5/84)	- Monitoring of all tanks required; retrofit on phased schedule - Monitoring alternatives specified	- Retrofit to provide monitoring for all tanks - Unless approved design, all tanks must be lined or replaced (phased schedule) - Overfill protection retrofit - all tanks	- Mandatory retirement of tanks not complying with new tank standards commencing 1/99
4.	Kansas (Regulations implemented 5/84)	- Daily inventory control	- Tanks excavated for repair must meet new tank standards	- Not specified
5.	Maryland (Regulations proposed 9/84)	- Precision tightness testing of all tanks buried 15 years or more within 24 months and every 5 years thereafter - Daily inventory control (tanks installed after 4/78)	- Tanks installed after 4/78 must comply with NFPA and API standards - Relining of steel tanks in accordance with API 1631 and with cathodic protection	- Not specified

Table 2-4
(continued)

State UST Program	Leak Detection	Repair, Relining, Retrofit	Mandatory Retirement
6. New Hampshire (Regulations proposed 2/85)	- Inventory controls or annual stand pipe test - Initial tank tightness test with followup every 5 years; groundwater, soil, or subsurface monitoring may be acceptable alternative	- Repair by installing liner once - Retrofit with striker plate - Tightness testing of relined tanks	- All tanks less than 20 years must be replaced at age 25 - All tanks more than 20 years must be replaced over 4-year schedule
7. Rhode Island (Regulations effective 5/85)	- Precision testing of all existing tanks by 5/87 - Annual precision testing or continuous monitoring in combination with precision testing - Line leak detection system for UST with remote pumps by 5/87	- Overfill protection retrofit by 5/87 - Line leak detection retrofit for UST with remote pump by 5/87	- Not specified

New Tank Standards - Table 2-5

- All states except Kansas require improved tank designs which emphasize environmental protection. Kansas requires an impervious base and observation pipe in the tank excavation.
- Secondary containment is required in three states (California, New Hampshire, and Rhode Island).
- Most states require installation in accordance with NFPA and manufacturers' standards, and tank testing prior to operation.
- New tank monitoring requirements vary widely from no requirements in Connecticut, to stringent requirements in California and Rhode Island.
- Overfill protection is required in three states (California, Florida, and Rhode Island).

In summary, states are implementing a variety of different technical standards, particularly related to leak detection requirements. The states are more similar in their approaches to regulating new tanks than they are in their approaches to regulating existing tanks. The schedules for compliance with regulations also varies among the states.

2.3.3 State Regulatory Trends

New state regulations governing underground storage vary greatly in terms of their status and scope. However, the following general trends are noted:

- There continues to be a high level of state interest and activity related to development and implementation of comprehensive UST programs.
- Most state activity is related to underground storage of petroleum products, rather than hazardous substances.
- Most state programs stipulate detailed procedures and technology-based requirements. These procedures and requirements vary greatly from state to state.

Table 2-5

Comparison of Seven Comprehensive State UST Programs
-- New Tank Requirements

State UST Program	Design Requirements	Installation Requirements	Monitoring Requirements
1. California (Regulations adopted 1/85)	- Improved tank designs (differ for motor fuel and hazardous substances) - Primary and secondary containment (hazardous substance tanks only) - Overfill protection (all tanks)	- Meet NFPA and manufacturers' specs - Tank testing prior to being put into service	- Visual monitoring when feasible - Daily monitoring of all tanks, alternatives specified - Inventory control - motor fuel tanks
2. Connecticut (Regulations adopted 11/85)	- Improved tank designs - Piping and underground components protected against corrosion and designed to facilitate testing - Contact plates	- Meet NFPA and manufacturers' specs; contractor certification - Tank tightness testing within 2 years of installation and 1 year before end of tank guarantee	- No blanket monitoring requirements - State may stipulate groundwater monitoring wells - Daily inventory control
2. Florida (Regulations adopted 5/84)	- Improved tank designs (4 designs allowed) - Corrosion resistant piping - Overfill protection - Striker plate	- Meet NFPA, API, UL, and manufacturers' requirements - Test FRP for deflection - Allow testing of piping	- Leak detector system monitoring (tank and piping) monthly - Inventory control
4. Kansas (Regulations implemented 5/84)	- Tank must be installed on impervious base sloped to collection basin equipped with observation pipe - Plans must be submitted for review and approval by state	- Testing of tank and piping required prior to use	- Leak detection on underground pressurized piping - Daily inventory control
5. Maryland (Regulations proposed 9/84)	- Cathodic protection system testing - annually - Improved tank designs (cathodic protection or noncorrosive material) - Pressure drop leak detectors (submersible pumps) - Overfill protection (at state's discretion)	- Meet NFPA, NACA, and manufacturers' specs - Tank testing prior to installation (precision testing or air test	- Inventory controls - Two permanent monitoring wells

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Table 2-5
(continued)

State UST Program	Design Requirements	Installation Requirements	Monitoring Requirements
6. New Hampshire (Regulations proposed 2/85)	- Improved tank designs - Leak detection system - Secondary containment and striker plate - Piping protected against corrosion and accessible for testing - Submit plans for review and approval	- State approval prior to installation - Corrosion specialist supervise installation of cathodic protection - Pressure testing new tanks	- One of following: annular space monitoring; in-tank monitoring; equal leak monitoring system
7. Rhode Island (Regulations effective 5/85)	- Improved tank design with corrosion protection - Pipe, fittings, and pumping systems must be cathodically protected or nonmetallic pipe - Emergency shut-off valves and over-full protection - Line leak detectors on lines with remote pumps - Plans must be submitted for review and approval	- Meet NFPA Code 30 and manufacturers' specs - Precision testing prior to operation	- One of following: continuous monitoring and precision testing; double-walled tank with interstital monitoring; or secondary containment with continuous monitoring - Observation wells at state's discretion near drinking water supplies

- Inventory control is mandated in most states. However, the method, frequency, and reporting requirements to be used vary greatly.

- State programs are more similar in their approaches to regulation of new tanks than their approaches to regulation of existing tanks.

The wide variety of regulations facing owners and operators of underground storage tanks indicates that extensive public education and technology transfer programs will be needed to achieve compliance.

2.4 LOCAL REGULATORY INITIATIVES

2.4.1 Introduction

Under Section 9008 of RCRA, a state or local government may establish UST regulations, requirements, and standards which are more stringent than the federal program.[2] Nearly 100 cities and counties have promulgated ordinances governing underground storage tanks. The scope and detail involved in the local programs varies widely. Several of the most comprehensive programs are listed in Table 2-6.

In some cases, state regulations preempt local ordinances. Other states have delegated the authority to local governments. Several examples are highlighted below.

2.4.2 Existing Local Regulations

The State of California adopted UST regulations in January 1985. Cities and counties which adopted their own ordinances and regulations prior to 1 January 1984 are exempt from the state regulations. All other cities and counties are required to implement the state regulations. As indicated in Table 2-7, owners and operators of underground storage tanks may be subject to any one of 54 regulatory programs in the state (53 local ordinances or the state regulations), which are administered by 99 different local agencies.

There has been no UST legislative initiative at the state level in Texas. However, the City of Austin, Texas adopted one of the most stringent UST programs in the country in December 1984. Austin's ordinance governs above-ground and under-ground tanks for storage of hazardous materials.

Austin's program requires permits to be obtained from the local fire marshall. All new tanks must consist of one of the following: double-wall tanks with internal monitoring; tank liner system; or a modified vault with electronic monitoring. In addition, secondary containment for piping and overfill protection is required for new tanks. Existing tanks must meet one of two leak detection options: daily inventory control, leak detection on subpumps, and precision testing on defined schedule based on age; or installation of leak detection in monitoring wells adjacent to the facility.

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[2] Tulsa Letter, May 1984.

Table 2-6

Partial List of Local Underground Storage Tank Regulations

Santa Clara County, California San Francisco Water Quality Board, California
Broward County, Florida (Proposed) Dade County, Florida
Savannah, Georgia (Proposed)
New Orleans, Louisiana (Proposed)
Baltimore, Maryland (Proposed Montgomery County, Maryland (Proposed)
Cape Cod Planning and Economic Development Commission, Massachusetts
Omaha, Nebraska
Nassau County, New York Suffolk County, New York
Philadelphia, Pennsylvania
Austin, Texas
Fairfax County, Virginia (Proposed)

Table 2-7

State of California -- Local UST Regulations

	Number with Local Ordinances[1]	Number Implementing State Regulations	Total
Cities	33[2]	12	45
Counties	20	34	54
Total	53	46	99[3]

NOTES

[1]Cities and counties with local ordinances in place prior to 1/1/84 are exempt from state regulations.

[2]Does not include one city which delegated program to county.

[3]Owners and operators of UST in California are regulated by 54 different programs involving 99 regulatory agencies.

Source: State of California, State Water Resources Control Board, Memo dated 13 August 1985.

If the tank site is located in the Edwards Aquifer or its recharge zone, double-wall tanks and liner systems are the only acceptable methods of secondary containment.

Dade County, Florida passed a package of ordinances governing management and disposal of hazardous materials in November 1982. These regulations govern establishment of a trust fund for hazardous waste cleanup, permitting of liquid waste transporters, and regulations governing under-ground storage of hazardous materials and hazardous waste. The UST ordinance regulates the permitting, design, installation, modification, repair, replacement, and operation of UST for hazardous materials. All existing tank operators must maintain daily inventory control systems. In addition, all existing tanks within the cone of influence of the Northwest Well Field, within 210 days travel time of any potable public water supply well, or located in an area where public water supply is not available, must meet additional protective measures. These protective measures include installation of continuous leak detection systems and secondary containment in accordance with a schedule tied to tank age. Tanks located outside city limits in these vulnerable water supply areas are also regulated.

New tank standards in Dade County, Florida are among the most stringent in the country. All new tanks must be equipped with line leak detectors, four groundwater monitoring wells (if in close proximity to water supply), continuous automatic leak detection, and secondary containment. Written approval of plans must be obtained prior to installation, and installation must be supervised by a registered professional engineer or under-ground storage facility supervisor.

Suffolk County (Long Island), New York adopted a comprehensive UST program which became effective in October 1982. Suffolk County's program regulates gasoline and oil storage tanks, as well as hazardous substances and hazardous waste tanks. All existing tanks and piping must be modified to meet new tank standards in accordance with a specified, phased schedule. New tank standards require installation of leak detection systems, line leak detection systems, and daily inventory reconciliation.

New tanks must meet improved tank design standards which are specified in the ordinance. New tank piping must have corrosion protection, be able to withstand pressure testing, and be equipped with a monitoring system. Hazardous materials storage tanks must meet more stringent design standards than oil and gasoline storage tanks, which include secondary containment, as well as installtion of manways, striker plates, and overfill protection. Petroleum product tanks in sensitive recharge and water supply areas must also comply with the more stringent, nonpetroleum tank standards. An unusual feature of Suffolk County's ordinance is that all new tank installations must be inspected and certified by a county representative prior to backfilling.

2.4.3 Regulatory Trends

In summary, local governments are actively involved in the development and implementation of comprehensive UST programs. These programs are highly variable in terms of the required technical standards for tank design and leak detection systems. However, most local programs are more stringent and more comprehensive (governing both oil and hazardous substances) than their state counterparts.

For the most part, local governments with sensitive groundwater resources have been most active in the development of comprehensive UST programs. In many cases, more stringent requirements are specified for tanks located in recharge areas and in the vicinity of public water supplies.

Local UST activity has in many cases preceded the development of comprehensive state programs. States recognize the importance of local involvement. However, the large and growing number of state and local governments involved in the regulation of UST presents tank owners and operators with a myriad of complex and conflicting compliance requirements.

SECTION 3

TANK ASSESSMENT AND AUDITING TECHNIQUES

3.1 INTRODUCTION

EPA's policy is to encourage the use of environmental auditing techniques by the regulated community to help achieve and maintain compliance with environmental laws and regulations, as well as to help identify and correct unregulated environmental hazards.[1]

Environmental auditing can help to ensure compliance with underground storage tank regulations. Even with active state and local involvement, regulation of more than 1.2 million tanks is a challenge that cannot be met adequately by regulatory agency enforcement and inspection activities. Environmental auditing can improve compliance by complementing regulatory agency oversight activities.

Environmental auditing techniques typically evaluate the effectiveness of direct compliance management activities. These activities include obtaining permits and meeting their requirements, installing monitoring systems, keeping records, and reporting violations. Environmental auditing is used to verify compliance with these environmental requirements, but also to evaluate the effectiveness of management systems, or assess risks associated with regulated and unregulated activities.

As shown in Figure 3-1, for underground storage tanks, both the tanks themselves and the monitoring and assessment systems can be audited.

[1] "Environmental Auditing Policy Statement," U.S. EPA, 50 FR 46504, 8 November 1985.

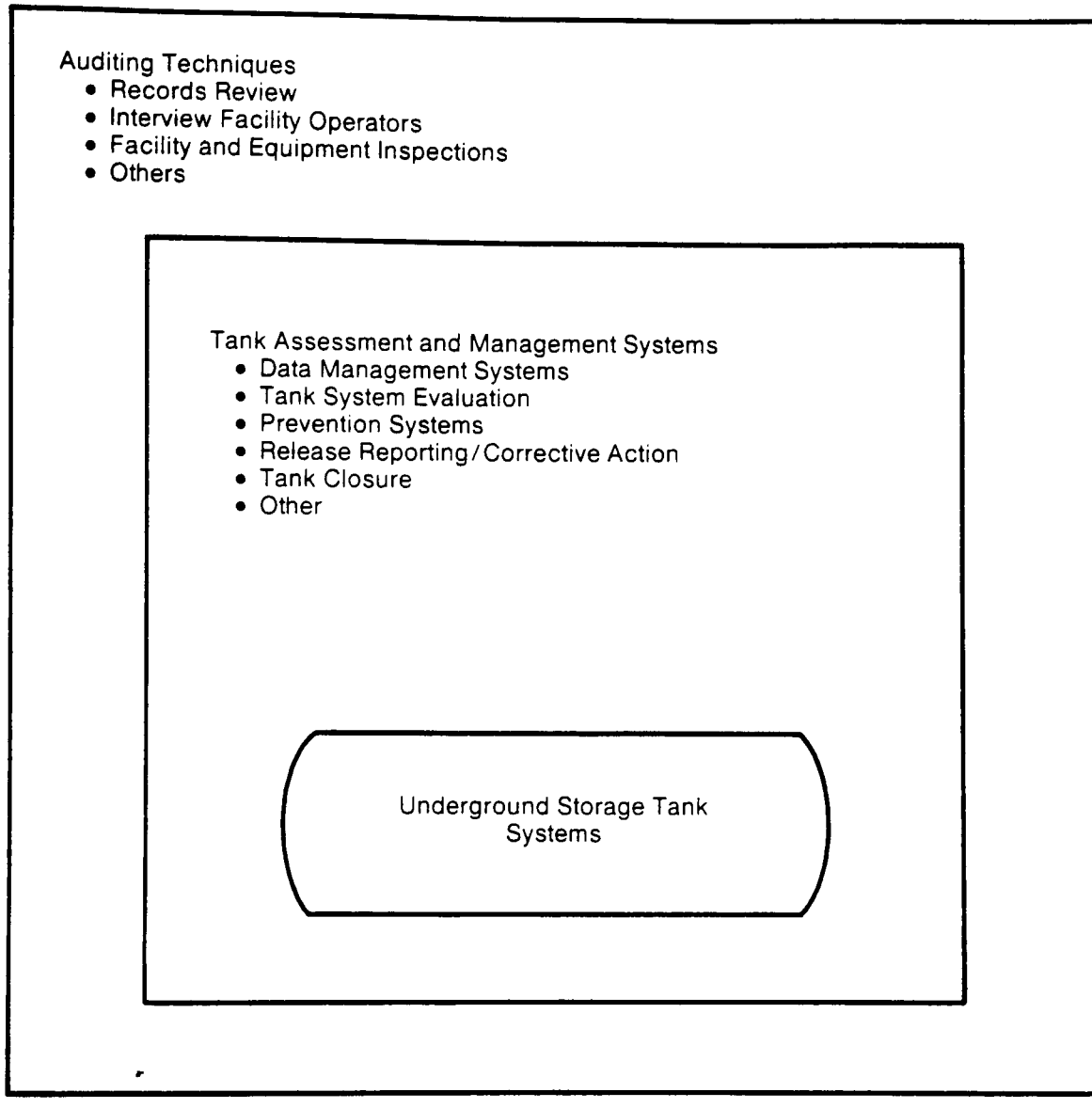

Figure 3-1. Tank assessment and auditing techniques.

3.2 STATUS OF UST AUDITING

Interviews with representatives from various industries and government agencies subject to underground storage tank regulations indicate that development of UST auditing techniques is still in the preliminary stages. The current emphasis is on installation of facilities and equipment and establishment of recordkeeping and management systems required by regulations. As would be expected, the petroleum industry is a leader in this area.

For example, one major oil company has initiated a program of replacing all tanks on each site that it owns or operates by 1990. Each newly installed tank system is to be equipped with two observation wells in the tank backfill. Several major oil companies are conducting integrity testing of all their tanks. Tanks at these locations are being replaced with new tanks that conform with the oil company specifications. Several oil companies have actually conducted studies of various tank systems, and developed engineering specifications for new thicker-walled and specially-outfitted tanks based on the results of these studies.

Many electric utilities are currently inventorying their collection of tanks in order to prepare tank notification forms by 8 May 1988. At least two utilities interviewed have initiated comprehensive tank testing programs to identify existing and potential problems. The utility industry also performs daily inventory reconciliation of the tanks it owns.

A finishes and formulation manufacturer is conducting precision testing of all their tanks. An observation well is then to be placed in each backfill area surrounding a tank following integrity testing. If the well is clean, a second well is drilled and will be equipped with an as of yet unspecified type of continuous monitoring equipment. Problem tanks are being retired and removed, and the extent of contamination is assessed during removal and cleaned up.

A major electronics component manufacturer has prepared an inventory of all tanks, and conducted field validation of the data. Twenty-five abandoned tanks were removed prior to the 8 May 1986 notification deadline. Remaining in-service tanks are managed using a computerized data base which holds information on both UST-reportable and non-reportable tanks. The remaining tanks will be tested, and replacement or retrofitting priorities set based on the test results. This industry has also developed audit checklists for underground storage tanks, which are included as Attachment A.

The Industry Clean Water Task Force (ICWTF) is a coalition of electronics companies in Santa Clara County, California which is involved in cleaning up sites with contaminated soils or groundwater. The ICWTF is providing public information on cleanup progress and working with regulatory agencies to prevent future leaks. The UST-related activities of this group have included:

- Closure or removal of 60 percent of the tanks in-ground as a precautionary measure.
- Integrity testing of remaining tanks, in conjunction with routine monitoring.
- Installation of secondary containment systems on existing tanks.

The Department of Defense established the Defense Environmental Leadership Project in the Office of the Secretary of Defense in January 1984. The Leadership Project is charged with developing innovative solutions to long-term environmental problems, including the UST issue. DOD has established procedures for daily inventory reconciliation by operating personnel, with monthly accounting performed by the Installation Fuels Management officers. This monthly accounting process is a form of auditing. DOD standards also require routine visual inspections of tanks, and pipeline and piping inspections at specified intervals. In addition, periodic tank integrity testing and checking of cathodic protection systems are required.

The U.S. Air Force has developed an Environmental Compliance and Management Program (ECAMP) manual. This manual is a guide for conducting comprehensive environmental audits at Air Force bases. The ECAMP Manual includes audit procedures related to UST. Specifically, the ECAMP manual addresses auditing of cathodic protection mechanisms, inventory control, and UST notification. In short, the DOD has taken a proactive approach to UST compliance and is working closely with EPA to develop innovative compliance strategies.

In this section, the various types of tank assessment and management systems currently in use are briefly described. Auditing techniques which can be used to evaluate each of these systems are briefly discussed. Auditing techniques applicable to the various tank assessment and management systems are summarized in Table 3-1.

Table 3-1

Summary of Auditing Procedures Applicable to Tank Assessment and Management Systems

Tank Assessment and Management Systems	Auditing Procedures																
	Inquiry			Records Review							Testing			Observation			
	Owner/Operator	Manufacturer	Regulatory Agencies	Notification Forms	Permits	Leak Detection	Inspection/Calibration	Tank Testing	Training	Incident Reports	Leak Detection	Calibration Systems	Alarms/Shutoff	Leak Detection	Tank Testing	Site Conditions	Access/Security
Data Management System	X			X	X	X	X	X	X	X							
Tank System Evaluation																	
Manual Inventory Control	X					X				X				X			
Automatic Inventory Control	X	X				X	X			X	X	X	X	X			X
Tank Testing	X	X						X	X	X					X	X	X
Site Inspection	X									X				X		X	X
Groundwater Monitoring	X				X					X							X
External Monitoring	X						X			X							X
Secondary Containment	X					X	X			X	X	X	X	X		X	X
Pipeline Leak Detectors	X	X				X	X			X	X	X	X	X			X
Prevention Systems																	
Existing Tank Retrofit																	
- Cathodic Protection	X						X		X			X				X	X
- Lining/Relining	X	X							X							X	
- Mandatory Retirement	X			X	X												
- Overfill Protection	X						X					X	X			X	X
New Tanks																	
- Design	X	X			X											X	
- Installation		X			X			X	X							X	
- Overfill Protection	X				X		X					X	X			X	X
Release Reporting/ Corrective Action																	
Release Reporting	X			X						X							
Corrective Action	X	X							X	X						X	
Tank Closure																	
Temporary	X			X		X	X	X								X	
Permanent	X			X												X	
Abandoned Tanks	X			X												X	

3.3 DATA MANAGEMENT SYSTEMS

3.3.1 Description

The tank notification program established under RCRA requires owners of in-service tanks to notify designated state or local agencies of the age, size, type, location, and use of all tanks by 8 May 1986. In addition, owners of tanks taken out-of-service after 1 January 1974 must also provide notification to the designated agencies.

Many industries and agencies subject to the UST regulations own or operate hundreds of tanks throughout the country. The notification process forces tank owners to determine how many tanks they have and where they are located. In addition, owners are forced to face the fact that they are probably going to have to meet different regulatory requirements in different parts of the country.

As a result, some tank owners have established computerized data management systems (DMS) to manage their tank programs. For example, an electronics manufacturing operation stores data on all tanks, including septic tanks, fuel oil tanks, above-ground tanks, and UST. Data stored in the DMS includes tank location, use, size, type, interior/exterior protection, date in service/out-of-service, and tank testing information. Both UST-reportable and nonreportable tanks are included in the system. The DMS is used currently to drive the tank notification process, identify abandoned tanks which will be removed prior to the May 1986 deadline (to avoid notification), and identify tank retrofit/replacement requirements. In the future, the DMS could be used as a trigger mechanism, to ensure tanks are tested and replaced on schedule and in accordance with regulatory requirements. This capability will be particularly important because the manufacturer has tanks in four states with widely variable regulatory requirements. The DMS is a corporate (as opposed to a plant-level) initiative, due to the complexity of UST compliance and the multimillion dollar cost of compliance.

A DMS may be much more simple and less comprehensive than the one described previously and may consist of no more than tank notification information. Other regulated entities may use a DMS to ensure tank operating permits are obtained and renewed in a timely manner.

3.3.2 Audit Procedures

Audit procedures will vary in accordance with the scope and objectives of a company's DMS. In all cases, review of the data to verify that it is accurate and kept up-to-date is a key auditing technique.

A unique feature of a DMS is that it can actually be used to drive the audit program. The auditor can use data from the DMS to locate tanks for inspection; determine (through interviews) if the tanks are tested in accordance with established schedules and procedures indicated in the DMS; and verify that new tanks are properly entered into the system.

3.4 TANK SYSTEM EVALUATION

3.4.1 Manual Inventory Control

Description

Instituting and correctly following a manual procedure for inventory control is widely recognized as an important component in the operation of an under-ground storage tank system. Manual inventory control generally involves the measuring of fuel stocks in a tank system at set intervals using a gauging stick, obtaining readings from metering pumps at the dispensers, and calculating any quantity of fuel that was delivered to the tank system since the last inventory measurements. All of these numbers (stock on hand, fuel dispensed, and fuel delivered) are balanced against one another to determine if any unexplained loss or addition is found. This results in the calculation of the mass balance of fuel in the tank over a specific interval. Measurable losses or additions are usually attributed to one or more factors including:

- Tank or pipe leak.
- Short or over delivery of fuel.
- Theft.
- Calibration problems in metering pumps.
- Human error in measurement and arithmetic operations.

Reconciliation calculations should be recorded in a permanent form; these records should be maintained for some set period of time.

Audit Procedures

Auditing of manual inventory control systems would usually include several steps performed during a site inspection. An interview with the tank owner/operator will serve to discover if such a system is in place and is followed on a regular basis. All records on-site pertaining to the inventory reconciliation should be examined to verify the completeness and frequency of the system's operation. Any discrepancy that may indicate a tank system problem should be noted. Interviews should be used to verify that corrective action or investigation has been taken or made.

3.4.2 Automatic Inventory Control

Description

This type of system usually involves the installation of a set of equipment mounted both inside of and external to a tank system for the purpose of taking either periodic or continuous measurements of the volume of fuel in an underground storage tank system. The automatic system eliminates some of the human error associated with manual inventory control such as measurement and arithmetic errors. It also produces more data points during day-to-day operation than manual tank gauging and, therefore, may more clearly point out trends that might be indicative of a problem. The major disadvantages include considerable costs associated with purchase, installation, and maintenance.

The automatic inventory control systems determine the mass balance of the UST system in which it is installed. Some of the devices on the market have built-in microprocessors that reconcile the inventory and produce a printed report, while others have computer communication to a remote station where inventory reconciliation takes place.

Audit Procedures

Audit procedures for on-site controlled versus remote computer controlled automatic inventory control devices differ in that the on-site controlled devices include a site inspection. This is necessary to ascertain the operating status of the device. During the site visit, the printed records should be examined to determine if inventory discrepancies have been investigated and corrective action has been taken, if necessary. Remotely controlled devices directed from a central control area enables a number of sites to be audited quite easily. The audit should determine if any necessary corrective action was taken in response to problems.

3.4.3 Internal Tank Testing Methods

Description

The precision or final test is specified by NFPA as the method for tank testing and is defined in NFPA 329 as a test that is designed to determine if either parts or the entire tank system are tight. NFPA requires these tests to detect a leak of $\geq$0.05 gal/hr or 1.2 gal/day, while taking a number of critical test parameters, such as temperature, condensation, and tank-end deflection into account. To perform the test, the tank system must be taken out of service for a period of not less than four hours. This method is not used as a leak detection method since it is too costly to perform regularly. Between testing, a long interval with even a small leak could release a considerable quantity of fuel into the environment surrounding the site. Therefore, tank testing is used to confirm a suspected tank system problem. It is necessary to have a trained operator conduct the test because of its complexity.

Evaluations of internal tank testing methods are currently undergoing extensive field evaluation studies by an EPA contractor. These studies will address the performance of various systems under a number of field conditions and will look at improvements that might be made to some of these systems. The results of these studies should be available by mid-1986.

Audit Procedures

The major consideration in the successful performance of the NFPA precision test is the skill of the operator conducting it. Therefore, determining if the test operator has had the correct training is paramount. This could be done by interview and observation of the operator during a test.

A clearer picture of alternative internal testing techniques may emerge after the above mentioned report is issued. A further evaluation of audit procedures for these devices would be premature at this time.

3.4.4 Site Inspection

Description

A simple and easy but important method for the detection of some UST leaks involves walking the site using trained eyes and other senses to detect changes on the site that could be due to a leak. Some observations that may lead to the conclusion that a leak exists include the detection of a strong odor, the presence of surface stains, stressed vegetation, or physical evidence of vandalism. Any of these observations should be noted in an inspection log. Any action taken in response to these conditions should also be noted.

Audit Procedures

Audit procedures for this technique involve interviewing the personnel charged with conducting site inspections to determine if useful observations are being made on a regular basis. In addition, the site should be walked to confirm that no pertinent indications of a leak have been overlooked.

3.4.5 Groundwater Monitoring

Description

Groundwater monitoring involves examining the groundwater that is found in or around a specific location for any material that degrades the quality of that water. Evaluations of groundwater usually include chemical analyses, determining physical parameters such as depth and flow direction, and aesthetic qualities such as smell, taste, and color. This type of investigation includes only those methods that examine the water at or below the groundwater surface.

This type of UST monitoring is required by only a few states. In addition, EPA seems reluctant to encourage this method of tank monitoring due to problems with determining the presence of fuels in groundwater. The construction of wells is both complex and costly and, if the groundwater table is deep, a considerable quantity of fuel could be released from a UST before it could be detected in the groundwater.

The results of a groundwater monitoring program usually include both qualitative and quantitative data about the presence or absence of contaminants of interest.

Audit Procedures

In almost every state, a well drilling permit is required before a well can be installed. This permit should be examined and compared with conditions on-site to determine if the location and number of wells indicated is correct. The wells should then be examined to see if the locking caps are in place, the surface grout seal is intact, and the casing appears straight. Interviews should then be conducted with personnel who are responsible for the well sampling to determine what procedures are followed. A check of the records should be conducted to determine sampling frequency. A data review to ascertain if any problems have been noticed and appropriate response to them will complete the audit of the site.

3.4.6 External Monitoring of Tanks

External tank monitoring is a method to rapidly detect a release of stored fuel into the immediate environment surrounding a UST system. The basic devices used in this type of UST monitoring is the observation well. Devices in this category include groundwater monitor wells, vapor wells, U-tubes, or lysimeters. Proper installation of these devices in the tank backfill is critical to the success of their operation. Problems are usually encountered when trying to install these in existing sites. Drilling clearances in the tank backfill can pose a serious safety hazard and the alternative, placing the wells away from the tank, will lessen the possibility that a leak can be detected.

Each of these types of observation wells can be outfitted with an array of detection sensors such as grab samplers, electrical sensors, or chemical sensors. These sensors can be used to periodically monitor for petroleum hydrocarbons. In some cases, sensors that monitor continuously can be installed. This is usually required in an environmentally sensitive area. It is worth noting that many of the sensors currently on the market have had limited field testing and are, therefore, basically unproven. EPA is currently conducting evaluations of each type of device or sensor at their research laboratory in Las Vegas. A report on the relative performance of each device should be available by the fourth quarter of 1986.

Audit Procedures

If this type of device is installed around an underground storage tank, the auditor must conduct a site inspection and interview to determine if the system is in-place and being used. A check of the maintenance and sampling log will verify the frequency of operation and will allow a review of the monitoring data to determine if corrective action has been taken as needed.

3.4.7 Secondary Containment Monitoring

Description

There are three basic methods by which a secondary containment system can be incorporated into a UST system. They are:

- Double-wall tank.
- Containment liner.
- Vaulted tank.

The major advantage of these systems is the high level of protection against release of fuel that they afford. Besides providing two barriers that would have to be breeched to release fuel to the environment, there is usually a space between these walls or barriers known as the annular space that can be monitored either continuously or periodically. This will alert the operator if a problem exists in the tank system.

There are a number of disadvantages to secondary containment. These include:

- Cost -- It is two to five times more expensive to install secondary containment than a corrosion protected single wall tank.

- Installation problems -- Liners and vaults are difficult to install correctly.

In critical areas, such as areas where the release of fuel would have a deleterious effect on a large number of people, the use of secondary containment is clearly warranted and monitoring of the annular space is necessary. The methods used to monitor the annular space fall into a number of categories including:

- Visual and olfactory inspection of vaults.

- Vacuum pressure gauges to monitor a vacuum pulled on the annular space in a double-wall tank.
- Various electrical or chemically activated sensors placed in the annular space of tanks, vaults, or liners.

Audit Procedures

Audit procedures will vary according to the type of method used to monitor the annular space. A site inspection, an examination of the inspection log, as well as an interview with the on-site personnel who are charged with making the inspections are required audit procedures. An examination of any instrumentation used for monitoring is also required. The auditor should also determine if any investigation or corrective action has been taken when warranted.

3.4.8 Pipeline Leak Detectors

Description

Recently developed statistical analyses of leaking tanks have shown that pipeline leaks are responsible for about 50 percent of all tank system leaks. Leaks in pressure piping can largely be eliminated by the use of pipeline leak detectors, as long as they are operating properly. Pipeline leak detectors have an internal hydraulic circuit which tests the delivery line for a drop in pressure each time the line is used. If the line pressure has dropped, the detector will shut off product flow. This detector action is automatic and requires no decision on the part of the tank system owner/operator.

Some systems utilize suction pumps to dispense fuel. In these cases, the use of a check valve on the line is indicated. If a leak is present, it will be demonstrated by a loss of prime in the line which will result in either a delay of the arrival of fuel at the nozzle or no fuel at all.

Audit Procedures

Check valves and pipeline leak detectors are routinely installed on UST systems. Unfortunately, their function can be abridged by tampering with the mechanism. During an audit, the pipeline leak detectors should be inspected to determine if the tamper seal is undamaged. An interview with the UST system owner/operators should be conducted to see if reduced or low-flow conditions that might be the result of a pipeline leak have been noticed and appropriate corrective actions have been initiated.

3.5 PREVENTION SYSTEMS

3.5.1 Existing Tanks

3.5.1.1 Cathodic Protection System Retrofit of Steel Tanks

Description

A cathodic protection system reduces or eliminates corrosion of metallic tanks by inducing electrical current in the soil (impressed current system) or creating a current reversal (sacrificial anode or galvanic system). Cathodic protection systems can be retrofit on existing tanks. The systems are pre-engineered and must be installed in accordance with manufacturers' standards.

Two types of cathodic protection are commonly used, galvanic and impressed current. Both types can be retrofit to existing tanks. Galvanic cathodic protection employs sacrificial anodes composed of materials such as magnesium or zinc in electrical contact with the object to be protected. They protect by creating a current at the physical expense of the sacrificial anode. Systems using this type of anode must be correctly designed to operate adequately. Measurements of soil resistivity and the life expectancy of the system must be known in order to determine the type and size of the anodes required.

Impressed current cathodic protection employes direct current provided by an external source. This current is passed through the system by the use of non-sacrificial electrodes typically made of materials like carbon or platinum. These electrodes are buried on the site and connected to the positive terminal of a power supply. The tanks are connected to the negative side of the same power supply. The current generated protects the tanks from corrosion.

Of the two types, the impressed current system is the easiest to retrofit. Both systems do require periodic examination and maintenance to maintain protection levels. The impressed current cathodic protection is the easiest to inspect, but major disadvantages include a high power consumption and the possibility of electrical interference with foreign structures such as nearby tanks. Determining if a galvanic system is working is harder. Tank-to-soil electrical potentials should be measured on an annual basis. Site changes, such as the installation of a new water pipe may also upset the system.

Despite these problems, cathodic protection is a widely used method of protection for tanks and piping. In many cases, its installation into an existing tank system, which has not deteriorated too badly, can effectively extend life time.

Audit Procedures

Audit procedures applicable to cathodic protection systems include:

- Verify that the system was inspected and tested prior to backfilling.
- Verify that the system is periodically tested and maintained while in operation. Records of testing should be reviewed to verify voltage does not exceed recommended limits.
- Inspect the system to detect signs of tampering. Verify that the power supply (impressed current system) and switches are secured from tampering and unauthorized disconnection.

3.5.1.2 Tank Lining and Relining Technology

Description

Repairing an underground storage tank usually costs considerably less than replacing it. One such method of repair involves the lining of the interior of a prepared tank with a plastic resin material such as epoxies or polyester resins. A limited amount of historical information as to the effectiveness of such a method of tank repair is available. A number of linings installed in the 1970's failed, probably due to material incompatibilities with the stored fuel. As a result of this problem, manufacturers have upgraded the formulation of the lining material and have developed stringent guidelines for the application of such materials. There have been no reported failures of the new formulations applied in the approved manner.

The performance of the application is still the limiting factor in the success of such repairs. In addition, any newly blended fuels must be compatible with the lining material. Also, the outer shell of the tank must be sound, since it provides structural integrity to hold the liner in place.

Audit Procedures

Tank lining audit procedures should include interviews with lining manufacturers to determine if the material to be used has been properly tested for compatibility. Additional site inspections should be made and interviews conducted with installers to determine if they are using installation procedures that comply with the manufacturers' recommendations.

3.5.1.3 Mandatory Retirement

Description

Some state and local programs or corporate policies require existing tanks to be replaced before a certain age, whether they are leaking or not. However, some agencies contend that a leak detection program can achieve basically the same result.

Audit Procedures

Audit procedures must be tailored to state and local requirements. The basic auditing technique would consist of reviewing tank notification forms to determine the approximate tank age, comparing the tank age to mandated retirement age, and verifying through interviews that the tanks have indeed been retired. Tank retirement should be accomplished in accordance with tank replacement and closure requirements contained in state or local regulations.

3.5.1.4 Overfill Protection Retrofit

Description

Certain states require existing tanks to be retrofit with overfill protection systems.

Overfill protection devices include audible or visible alarm systems, automatic shut-off devices, and liquid level sensors which monitor tank levels.

Spill containment systems are another common approach to overfill protection. The fill pipe is placed in a manhole below the surface into which the product drains. Spilled product may be removed by the use of "imbiber beads" which allow water to pass, but absorb hydrocarbons and swell. When they reach capacity, they completely seal the manhole. At this time, they must be replaced and disposed of as a hazardous waste. Other containment systems drain into the tank.

Audit Procedures

Obviously, auditing techniques for overfill protection devices must be tailored to state and local requirements and to the type of method employed at a given location. Some generic auditing techniques which may be applicable include:

- Verify overfill protection system is installed in accordance with applicable regulations.
- Verify tank operator is familiar with good operating practices (e.g., tank measurement prior to unloading, continuous monitoring of unloading, careful connection/disconnection of hose).
- Verify overfill protection devices are regularly tested (interview operators and check calibration standards).
- Verify spill containment system is properly maintained (inspect system and interview operator).
- If practical, observe tank filling procedure to ensure good operating practices are followed.

3.5.2 New Tanks

3.5.2.1 Design Standards

Description

Section 9003(g) of RCRA contains an interim prohibition on the installation of new steel tanks, which took effect 7 May 1985. Sometimes referred to as "the bare steel tank ban," installation of new tanks is prohibited unless the tank: will prevent releases due to corrosion or structural failure for its operational life; is cathodically protected or constructed of noncorrosive material, steel coated with a noncorrosive material, or designed to prevent release," and is made of material compatible with its contents.

Many states and local governments are including design standards for new tanks in their comprehensive UST regulatory programs. These standards generally require improved tank designs (e.g., fiberglas reinforced plastic (FRP) tanks, steel tanks with FRP coatings or cathodic protection, or noncorrosive tanks), and selection of tanks which are compatible with product stored and the surrounding environment. Similar design standards for underground piping are also specified. Design requirements also encompass proper sizing and siting of storage tanks and dispensers.

In addition, some states require secondary containment, as well as installation of leak detection systems, striker plates, overfill protection, or groundwater monitoring wells. Stenciling and marking of tanks is also required in a few cases. The design standards governing these items vary widely from state to state.

An unusual approach to regulating new tank design is employed by the State of Kansas. Instead of focusing on design standards for tank systems, the Kansas regulations focus on lining the tank excavation with an impervious material sloped to a collection basin equipped with an observation pipe.

State approaches to enforcement of design standards also vary widely. Some states require submittal of detailed plans for review and approval prior to construction. A few states have established permit requirements for new tanks. In a few cases, states have established detailed design standards which will be subject to inspection and enforcement actions.

Audit Procedures

Auditing techniques applicable to new tank design standards will have to be tailored to state and local requirements. General approaches to auditing could encompass:

- Review of the overall procurement practices employed by a company to ensure:
  - Purchasing department is familiar with new tank design requirements.
  - Environmental department is involved in selection and/or review of new tank specs to ensure tanks are compatible with material stored and environmental conditions.
  - Company policy governing tank procurement addresses safety and environmental concerns.
- Review of tank permit or registration (where applicable) to ensure appropriate approvals have been obtained.
- Interviews with facility personnel to establish their familiarity with state and local requirements.
- Spot checking of as-built drawings to verify compliance with design requirements. At a minimum, the location and type of system components could be verified using these drawings.

Development of guidance manuals and training programs tailored to state and local requirements will be a prerequisite for encouraging compliance with the various new tank design standards.

3.5.2.2 Installation Procedures

Description

Poor installation practices, including abrasion and deflection caused by crossed lines, improper material handling, incompatible pipe fittings, improper connections, poor tank siting or placement, and poor workmanship, have resulted in leaks and failures in numerous tank and piping systems. As a result, the importance of ensuring proper installation cannot be ignored during development of an overall compliance strategy.

Most state and local programs require new tanks to be installed in accordance with NFPA 30 and API standards, and in accordance with tank manufacturers' specifications. The tank owner is responsible for selecting qualified installation contractors and ensuring proper tank installation.

Even if a tank has been designed in accordance with established design standards, proper installation encompasses a variety of additional factors. These factors include proper material handling to prevent damage to tank shells and coatings; adequate excavation size, bedding, and site preparation; proper backfilling to provide structural support and protect structural integrity; proper anchorage; proper installation of containment and external monitoring systems; and proper installation of piping, valves, and fittings. In addition, tank and piping tightness testing is often required prior to operation. However, at least one state (Connecticut) requires tank testing within one to two years of installation, after the tank is put in operation. Leak detection and cathodic protection systems should also be tested prior to operation.

Audit Procedures

Effective auditing of installation procedures can only be accomplished in conjunction with evaluations of the adequacy of tank design, procurement practices, and contractor selection. In fact, auditing of installation procedures would best be accomplished during construction rather than "after-the-fact."

A certification program for tank installers has been considered by both state and federal regulatory agencies, but does not currently exist. Such a certification program would provide tank owners with some assurance that competent, well-trained personnel are installing their tanks. If a tank installer certification program is established, it could be audited by reviewing records and conducting interviews to verify that only installers with up-to-date certifications are used. An installers certification program would reduce the incidence of leaks attributable to poor workmanship and improper installation techniques.

Several states (e.g., Connecticut) require tank installers to cerfify that tanks have been installed in accordance with approved plans. In this case, auditing is accomplished by verifying certification has been submitted to the state and that a copy is kept on file. If the state or regulatory agency inspects and certifies compliance with installation requirements (as in Suffolk County, New York), this certification should also be verified and reviewed.

Another method of auditing tank installation would be to request and review copies of final test results for tank and piping tightness, satisfactory operation of leak detection and monitoring systems, and cathodic protection systems (if installed). This testing should be performed only by properly trained and certified personnel.

Finally, an audit should verify that the installer provided the tank owner with component documentation, including installation instructions for replacement parts, recommended test procedures, preventative maintenance schedules, and operational requirements. Compliance with these requirements should also be evaluated during the audit.

3.5.2.3 Overfill Protection

Description

Spills during product delivery may result from overfilling of tanks or from the product transfer connection between the tank and the truck. Transfer connections may not be regulated by RCRA because the hose is part of the truck rather than the tank. Overfilling can lead to two problems: environmental contamination and creation of corrosive conditions in soil surrounding the tank which may damage tank coatings.

Overfill protection devices include audible or visible alarm systems, automatic shut-off devices, and liquid level sensors which monitor tank levels. Some states and local governments have established design and operational standards for transfer facilities (such as truck fill stands) and unloading/loading facilities. The primary means of preventing spills from transfer connections involves the use of "dry-disconnect" couplings. The coupling is equipped with a spring-loaded valve which is opened after it is connected to a fill pipe and closed prior to disconnect. This device is larger and heavier than the more commonly-used "quick-disconnect" hose, making it more difficult to use.

Spill containment systems are a common approach to overfill protection. The fill pipe is placed in a manhole below the surface into which the product drains. Spilled product may be removed by the use of "imbiber beads" which allow water to pass, but absorb hydrocarbons and swell. When they reach capacity, they completely seal the manhole. At this time, they must be replaced and disposed of as a hazardous waste. Other containment systems drain into the tank.

New underground tank regulations generally require tank overfill protection. However, most regulations do not spell out how overfill protection is to be achieved.

Audit Procedures

Obviously, auditing techniques for overfill protection devices must be tailored to state and local requirements and to the type of method employed at a given location. Some generic auditing techniques which may be applicable include:

- Verify overfill protection system is installed in accordance with applicable regulations.
- Verify tank operator is familiar with good operating practices (e.g., tank measurement prior to unloading, continuous monitoring of unloading, careful connection/disconnection of hose).
- Verify overfill protection devices are regularly tested (interview operators and check calibration standards).
- Verify spill containment system is properly maintained (inspect system and interview operator).
- If practical, observe tank filling procedure to ensure good operating practices are followed.

3.6 RELEASE REPORTING AND CORRECTIVE ACTION

3.6.1 Release Reporting

Description

Section 9003(a)(C)(3) of RCRA requires EPA to establish requirements for reporting of releases and corrective actions taken. The term "release" is broadly defined to include "any spilling, leaking, emitting, discharging, escaping, leaching, or disposing from an underground storage tank." Releases to air are not included. EPA has yet to define at what level releases will have to be reported and who will have to be notified.

Most state UST programs require suspected leaks to be verified and reported to appropriate authorities within a specified time frame. In some cases, written status reports are also required.

Spill response and contingency plans are not specifically required under Subtitle I. Contingency plans for larger underground storage tanks (over 42,000 gallons) are required pursuant to the Federal Water Pollution Control Act Amendments of 1972 and are governed by regulations contained in 40 CFR 112.

Audit Procedures

To verify compliance with release reporting requirements, the following auditing techniques could be used:

- Interview facility owners and operators to determine whether they have established procedures for verifying leaks and notifying appropriate authorities as required by state and local regulations.
- Verify that the list containing names and phone numbers of authorities to be notified is routinely reviewed and updated.
- Determine if records (e.g., leak detection system records) containing time, date, and details of any reportable incident are kept. Review records and determine that proper notifications were made.

3.6.2 Corrective Action

Description

Subtitle I of RCRA does not define the term "corrective action." Thus, EPA will have broad latitude in defining what corrective action will mean.

Basically, implementation of corrective action involves two steps. First, tank operators have responsibility to make an acceptable response, such as removing remaining product from a tank to prevent additional leakage. In addition, appropriate actions should be taken to immediately respond to spills that may occur on a site or to contain a spill. The second step involves defining the extent of contamination, potential migration pathways and conducting a risk assessment. This information is used to define remedial action requirements. If the risk is significant, a remedial action plan will have to be developed and implemented.

State regulations vary with regard to their requirements for corrective action. Some states, such as New Hampshire, allow a tank to be repaired with a liner only once. In most states, repairs must be performed according to manufacturer's specifications and under the guidance of trained personnel. Tank testing is required prior to reuse. In states with mandatory retirement provisions or "retrofit to new tank standards" requirements, repair of leaking tanks may not be practical. Obviously, auditing techniques and protocols would have to be tailored to state and local requirements.

Audit Procedures

To verify compliance with corrective action requirements, the following auditing techniques could be used:

- Verify that a spill response kit is available and that it is properly stocked.
- Verify operators have been properly trained to respond to emergencies and spills.
- Verify the facility has established specific procedures for responding to spills and accidents. (An emergency response plan is not required by Subtitle I of RCRA. However, an audit should also address good management practices such as emergency procedures.)
- Review records of incidents. Verify that appropriate corrective actions are taken in a timely manner.

3.7 TANK CLOSURE

3.7.1 Temporary Closure

Description

Temporary closure requirements vary among state and local UST programs. The definition of temporary closure ranges from 180 days or less in Rhode Island, to two years or less in Suffolk County, New York.

Most states require tanks to be emptied, and fill lines and other openings to be capped and secured. In some cases, such as Suffolk County, tightness testing is required prior to reuse. In Florida, product may be left in the tank if weekly inventory control, monthly leak detection, and monitoring system evaluations are continued. Florida also requires monthly inspections of empty tanks.

Audit Procedures

Audit procedures for temporary closures include:

- Verify that proper notifications of state or local authority have been made.
- Conduct interviews and records review to verify required monitoring is performed.
- Inspect tanks to verify that the tanks are empty and access is controlled (locks are secured).
- Conduct interviews to verify that the period of closure has not exceeded the required time frame.

3.7.2 Permanent Closure

Description

Most state and local programs permit both on-site closure and removal of tanks. On-site closure typically consists of removing remaining product, cutting fill lines, and filling the tank with an inert material. However, some states have additional requirements. Rhode Island requires empty tanks to be cleaned and precision tested if they are to remain in the ground. California requires tank owners to demonstrate that no release has occurred.

The process for removing a tank typically involves removing remaining product, purging vapors, and puncturing the tank. California requires documentation of the method of disposal. Rhode Island requires tank owners to notify the state 72 hours in advance of excavation so the site may be inspected for the presence of pollutants. Rhode Island also requires that a certificate of closure be obtained.

Audit Procedures

Audit procedures for permanent closure include:

- Verify that proper notifications have been made. (The RCRA notification requirement pertains to tanks taken out of service after 1 January 1973.)
- Verify that the appropriate state or local approvals have been obtained prior to closure.
- When appropriate, verify that a certificate of closure has been obtained.
- Inspect site to determine if there is any evidence of improper or inadequate closure practices.

3.7.3 Abandoned Tanks

Description

An abandoned tank is one taken out of service prior to 8 November 1974 which remains in the ground. Tanks which have been abandoned without proper closure have the potential for deteriorating and leaking into the ground. EPA has yet to determine whether or not to include abandoned tanks in the UST regulations.

EPA has two options. First, abandoned tanks could be subjected to the same closure and corrective action requirements as operational tanks. The other option would be to limit the UST regulations to operational tanks.

Some states, such as Rhode Island, prohibit abandonment of tanks. Other states do not address this issue.

Audit Procedures

At a minimum, the audit should verify that proper notifications have been filed in accordance with Section 9002(a) of RCRA. RCRA requires that notification be filed by 8 May 1985 for all tanks taken out of service since 1 January 1973.

Information on the tank notification forms can be used as the basis for the audit. Interviews and site inspections should be conducted to determine if tanks have been properly closed and to identify any signs of leakage.

ATTACHMENT A

SAMPLE AUDIT CHECK LISTS FOR UNDERGROUND STORAGE TANKS

Facility	Compliance Category	Auditor(s)	Date

REGULATORY REQUIREMENTS	AUDIT QUESTIONS	ANSWER						AUDITOR COMMENTS
		Yes	No	N/A	Based On: Inquiry	Observation	Test	
1. A master list of all above-ground and underground storage tanks should be maintained at each facility (good management practice).	• Does the facility have a master list of all above-ground and underground storage tanks? • Does the master list contain information on: - Tank capacity? - Tank construction material and type of internal/external protection? - Tank age? - Dates of integrity testing? - Dates of service/repairs? - Leak detection systems in place? • Is a map available that shows the location of all tanks and piping? (The auditor should use this map for reference during the audit.)							

Facility	Compliance Category	Auditor(s)	Date

REGULATORY REQUIREMENTS	AUDIT QUESTIONS	ANSWER						AUDITOR COMMENTS
		Yes	No	N/A	Based On: Inquiry	Observation	Test	
2. Facilities with underground storage tanks for hazardous substances or petroleum products are subject to notification requirements (40 CFR 280). (NOTE: Heating oil tanks, septic tanks, and certain other tanks are exempt from notification requirements. Refer to definition of UST.)	• Was EPA Form 7530-1 "Notification for Underground Storage Tank in Use" or state form prepared and submitted to the designated state or agency by May 8, 1986? • Are copies of the notification forms maintained at the plant? • Is the information on the notification forms the same as that on the facility's master list of tanks? • Record any inconsistencies.							
3. Facilities with underground tanks taken out of operation after Jan. 1, 1974, but still in the ground should provide notification to the state by May 1986. Notification should include known information on:	• Have any underground tanks been taken out of service since Jan. 1, 1974? • Are any abandoned tanks still in the ground?							

Facility	Compliance Category	Auditor(s)	Date

REGULATORY REQUIREMENTS	AUDIT QUESTIONS	ANSWER						AUDITOR COMMENTS
		Yes	No	N/A	Based On: Inquiry	Observation	Test	
3. (continued) - Date of deactivation; - Substances in the tank; - Tank size and type; - Location of tanks (40 CFR 280) 4. Facilities that bring underground storage tanks into use after May 8, 1986 must, within 30 days of bringing such tanks into use, notify designated state or local agencies (40 CFR 280.3(c)).	• If so, has EPA Form 7530-2, "Notification for Underground Storage Tank No Longer in Operation," or state form been submitted to the designated state agency? • Are there any plans to install a new underground tank at the plant? • If so, is there a formal procedure to ensure that notification (registration) of new underground tanks will be made to the state within 30 days of bringing the tank into use? • EPA Form 7530-1, "Notification for Underground Storage Tank in Use," or state form should be used for this purpose.							

Facility	Compliance Category	Auditor(s)	Date

REGULATORY REQUIREMENTS	AUDIT QUESTIONS	ANSWER						AUDITOR COMMENTS
		Yes	No	N/A	Based On: Inquiry	Observation	Test	
5. Facilities may not install any new underground tank unless it has been cathodically protected or designed to prevent any release (RCRA Sect. 9004). (NOTE: This provision known as the "bare steel tank" prohibition will remain in effect until EPA issues performance standards for new underground tanks (scheduled for Feb. 1987).)	• Have all new steel underground tanks installed after May 1985 been: - Cathodically protected? - Constructed of non-corrosive material (e.g., fiberglas)? - Clad with a non-corrosive material? OR - Designed to prevent release?							
6. Inventory control procedures should be in place for all underground storage tanks (good management practice). (NOTE: The 1984 RCRA Amendments require EPA to issue leak detection, prevention, and corrective action regulations by Feb. 1987.)	• Are inventory and use records kept for all UST? • Does the facility: - Measure tank levels with a gauging stick on a daily basis? - Obtain readings from meters at dispensers? - Calculate quantity of material delivered to the tank?							

Facility	Compliance Category	Auditor(s)	Date

REGULATORY REQUIREMENTS	AUDIT QUESTIONS	ANSWER						AUDITOR COMMENTS
		Yes	No	N/A	Based On: Inquiry	Observation	Test	
6. (continued)	- Balance these numbers against each other to identify unexplained losses or additions? • Are calculations recorded in a permanent log? • Review inventory control records to verify completeness and frequency of operation. • Are any discrepancies noted? • If so, have follow-up investigations been made? (NOTE: Pressure testing with air or other gases to detect tank leaks is not recommended because of severe danger of tank rupture.)							

Facility	Compliance Category	Auditor(s)	Date

REGULATORY REQUIREMENTS	AUDIT QUESTIONS	ANSWER						AUDITOR COMMENTS
		Yes	No	N/A	Based On: Inquiry	Observation	Test	
6. (continued)	• Have releases been reported to state and EPA? • Have corrective actions been taken? (NOTE: NFPA 329 provides additional guidance on UST leakage.)							
7. Underground metallic storage tanks and pipings with cathodic protection must be routinely tested (good management practice).	• Does the facility have an underground metallic storage tank with cathodic protection? If not, go to Item 8. • For impressed current systems: - Is voltage checked monthly and recorded in a log? - Do records indicate the voltage is greater than -0.85, but not more than -3.0 volts? • For sacrificial anode system: - Is the voltage checked bi-annually?							

Facility	Compliance Category	Auditor(s)	Date

REGULATORY REQUIREMENTS	AUDIT QUESTIONS	ANSWER						AUDITOR COMMENTS
		Yes	No	N/A	Based On: Inquiry	Observation	Test	
7. (continued)	- Do records indicate the voltage is greater than -0.85, but not more than -3.0 volts? • Are failures and leak detection reported?							
8. Regular inspections of UST should be conducted (good management practice).	• Inspect underground storage tank sites. • Is there evidence of potential leakage, such as: - Strong odors? - Presence of surface stains? - Presence of stressed vegetation? - Presence of liquids in secondary containment system (if applicable)? - Evidence of spills (saturated and darkened soil, stained concrete, soft spots in asphalt)? - Damaged fill pipes?							

Facility	Compliance Category	Auditor(s)	Date

REGULATORY REQUIREMENTS	AUDIT QUESTIONS	ANSWER						AUDITOR COMMENTS
		Yes	No	N/A	Based On: Inquiry	Observation	Test	
8. (continued)	- Evidence of flammable or combustible liquids in streams and bodies of water (oil sheen)? - Excavations that may have damaged UST or indicate repairs? ● Are there signs of vandalism or tampering with: - Leak detection systems? - Valves or access ports? - Alarms? - Overfill protection devices? - Monitoring wells? ● Are inspection logs kept?							

Facility	Compliance Category	Auditor(s)	Date

REGULATORY REQUIREMENTS	AUDIT QUESTIONS	ANSWER						AUDITOR COMMENTS
		Yes	No	N/A	Based On: Inquiry	Observation	Test	
8. (continued)	• Does the facility have a leak detection system in place? If so: - Is the system routinely calibrated in accordance with manufacturer's instructions? - Does the system show signs of tampering? - Does the system indicate potential leakage?							