CHAPTER 5

REGULATIONS GOVERNING TREATMENT, STORAGE, AND DISPOSAL FACILITIES

In this chapter…

OVERVIEW

Treatment, storage, and disposal facilities are the last link in the cradle-to-grave hazardous waste management system. The requirements for TSDFs, located in 40 CFR Parts 264 and 265, are more extensive than the standards for generators and transporters. They include general facility operating standards, as well as standards for the

various types of units in which hazardous waste is managed. General facility standards address good management practices for any facility engaged in hazardous waste management. The technical standards go beyond these requirements to ensure that all elements of the TSDF are constructed and operated to prevent leaks of hazardous waste into the environment. The technical standards also address the diversity of hazardous waste operations being conducted around the country by guiding facilities in the proper design, construction, operation, maintenance, and closure of a variety of hazardous waste treatment, storage, and disposal units. These unit standards include requirements for a wide range of hazardous waste management units, from containers (e.g., 55-gallon drums) to landfills, in order to ensure that these units handle waste safely and effectively.

WHAT IS A TSDF?

With some exceptions, a TSDF is a facility engaged in one or more of the following activities:

- **Treatment** – Any method, technique, or process designed to physically, chemically, or biologically change the nature of a hazardous waste
- **Storage** – Holding hazardous waste for a temporary period, after which the hazardous waste is treated, disposed of, or stored elsewhere
- **Disposal** – The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid or hazardous waste on or in the land or water. A disposal facility is any site where hazardous waste is intentionally placed and where the waste will remain after a TSDF stops operation.

To help owners and operators of new and existing TSDFs comply with new RCRA regulations, RCRA divides them into two categories: permitted (new) and interim status (existing).

■ Permits and Interim Status

When Congress enacted RCRA in 1976, it directed EPA to develop standards for new TSDFs (those built after the standards were established) and for facilities that were already in operation. Congress further required that the standards for both new and existing facilities differ only where absolutely necessary.

New TSDFs, those facilities constructed after the regulations were promulgated, must be designed and built to meet the standards EPA deemed necessary to protect human health and the environment. To handle hazardous waste, a new facility must obtain a permit, in accordance with provisions in 40 CFR Part 270, before it begins operation. These facilities are called **permitted facilities**. (Permitting is fully discussed in Section III, Chapter 8.) The permit lays out the standards and requirements applicable to the specific activities conducted at that facility, including both the general facility standards and the standards applicable to each type of unit at the facility. The requirements for these facilities are located in 40 CFR Part 264.

On the other hand, facilities already in existence and operating may not immediately be able to meet the design and operating standards for new facilities. For example, when RCRA was enacted, existing hazardous waste management facilities immediately became subject to regulation, while other existing facilities managing nonhazardous waste were brought into RCRA by regulatory changes that made these wastes hazardous. For both sets of TSDFs, EPA created a special category of regulations to allow these facilities to gradually come up to speed with the

standards for permitted facilities. These facilities are called **interim status facilities**. While in interim status, facilities must comply with these separate standards, which are often less stringent than the standards for permitted facilities and are not tailored to individual sites, until they receive their permit. The requirements for these facilities are located in 40 CFR Part 265.

While the standards for permitted facilities are often similar to those for interim status facilities, there are circumstances where the standards for new facilities would be impracticable for existing facilities to implement immediately. This chapter will focus primarily on the standards for permitted facilities, contrasting them with the standards for interim status facilities where appropriate.

■ Exemptions

In order to promote certain beneficial activities or to avoid overlapping with the requirements of other parts of RCRA or other environmental laws, RCRA exempts certain types of facilities or operations from the standards for permitted and interim status TSDFs.

Permits-by-Rule

Facilities that have permits for certain activities under other environmental laws may qualify for a special form of a RCRA permit, known as a **permit-by-rule**. These activities include ocean disposal of hazardous wastes regulated under the Marine Protection, Research, and Sanctuaries Act (MPRSA); underground injection of hazardous wastes regulated under the Safe Drinking Water Act (SDWA); and treatment of hazardous wastewaters in a POTW regulated under CWA. Under this exemption, the facility's non-RCRA permit serves in place of a RCRA permit, provided the facility is in compliance with that permit and other basic RCRA administrative requirements. (Permits-by-rule are fully discussed in Section III, Chapter 8.)

Conditionally Exempt Small Quantity Generator Waste

Facilities that treat (including recycle), store, or dispose of only hazardous waste generated by CESQGs are excluded from the TSDF standards. RCRA requires that such facilities be permitted, licensed, or registered by the state to handle nonhazardous industrial or municipal solid waste, or qualify as a recycling facility. (CESQGs are fully discussed in Section III, Chapter 3.)

Recyclable Materials

RCRA provides separate, reduced regulations for TSDFs recycling certain materials. These recycling facilities are generally exempt from the TSDF standards, but may be required to comply with streamlined hazardous waste management requirements. These reduced provisions apply to facilities recycling:

- Precious metals
- Lead-acid batteries
- Used oil
- Hazardous waste burned in boilers and industrial furnaces.

For other recyclable materials, there are no special requirements. For example, facilities recycling the following materials are exempt from all TSDF standards:

- Industrial ethyl alcohol
- Used batteries returned to the manufacturer for regeneration
- Scrap metal
- Fuels produced from refining oil-bearing hazardous wastes
- Oil reclaimed from hazardous waste.

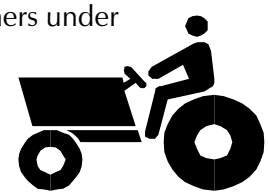
(Recyclable materials are fully discussed in Section III, Chapter 2.)

Generators

Generators accumulating waste on site in accordance with the generator regulations do not need a permit and do not have to comply with the permitted TSDF standards. They must comply with only those interim status standards specified in the generator regulations. On the other hand, if SQGs or CESQGs exceed their respective storage limits, or if LQGs or SQGs exceed their respective accumulation time limits, the facility becomes a storage facility subject to all applicable requirements for TSDFs (including permitting). (Generators are fully discussed in Section III, Chapter 3.)

Farmers

Farmers disposing of pesticide wastes on their own property in compliance with the disposal instructions on the pesticide label are also not subject to the TSDF standards. Congress did not want to regulate farmers under both RCRA and FIFRA. Therefore, farmers meeting these management conditions are exempt from the TSDF standards.



Totally Enclosed Treatment Units

Totally enclosed treatment units (TETUs) are designed and constructed to eliminate the potential for hazardous wastes to escape into the environment during treatment. If directly connected to an industrial production process, and treatment prevents the release of hazardous constituents into the environment, TETUs are exempt from the TSDF standards.

Elementary Neutralization Units

Elementary neutralization units (ENUs) are containers, tanks, tank systems, transportation vehicles, or vessels that neutralize wastes that are hazardous only for exhibiting the characteristic of corrosivity (D003). Neutralization in such units is exempt from the TSDF standards. However, neutralization in other types of units is regulated.

Wastewater Treatment Units

Wastewater treatment units (WWTUs) are tanks or tanks systems that treat hazardous wastewaters and discharge them pursuant to CWA (e.g., the discharge is sent to a POTW or to surface water under a NPDES permit). Such units are exempt from the TSDF regulations.

Emergency Response

Treatment, storage, and disposal activities that are part of an emergency response action taken to immediately contain or treat a spill of hazardous waste are exempt from TSDF standards. On the other hand, any treatment, storage, or disposal after the emergency situation has passed is subject to full regulation. Likewise, any hazardous waste generated during an emergency action must be managed in accordance with the generator standards.

Transfer Facilities

A transfer facility is a transportation-related facility, including loading docks and parking and storage areas, where shipments of hazardous waste are temporarily held during the normal course of transportation. A transfer facility temporarily storing a manifested shipment of hazardous waste for less than 10 days before transfer to the next designated facility is not subject to the TSDF standards. On the other hand, if transporter storage at a transfer facility exceeds 10 days, the transfer facility becomes a storage facility subject to all applicable

requirements for TSDFs (including permitting). (Transfer facilities are fully discussed in Section III, Chapter 4.)

Adding Absorbent

Because liquid hazardous wastes are not allowed in a landfill, absorbents must be added to the container to remove the visible liquids. Adding absorbent to hazardous waste may be considered hazardous waste treatment, thus triggering the TSDF standards. However, to promote the reduction of the amount of liquid hazardous waste sent to landfills, the regulations for hazardous waste treatment do not apply to a facility adding absorbent to waste when the waste is first put into a container. Subsequent addition of absorbent is not covered under this exemption and may be considered treatment subject to the TSDF standards.

Universal Waste Handlers

Handlers and transporters of recycled batteries, pesticides, and mercury thermostats are exempt from the TSDF standards. (Universal wastes are fully discussed in Section III, Chapter 2.)

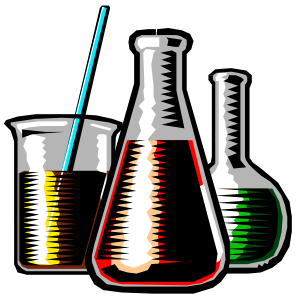
GENERAL FACILITY STANDARDS

If a TSDF is not exempt under any of these provisions, then it must comply with the standards for fully regulated TSDFs. These standards cover good management practices, including keeping track of the amount and type of wastes entering the facility, training employees to safely manage hazardous waste, and preparing to avoid hazardous waste emergencies.

■ EPA Identification Numbers

As with generators and transporters of hazardous waste, TSDF owners and operators are required to notify EPA of the types of hazardous waste they plan to treat, store, or dispose of by applying for an EPA ID number.

■ Waste Analysis



To keep track of the wastes being sent for treatment, storage, or disposal, TSDF owners and operators must analyze waste shipments. The TSDF's permit will list the types of hazardous waste that a facility is allowed to treat, store, or dispose. Analyzing the waste received ensures that the facility only handles wastes they are permitted to handle, and ensures that the wastes are treated, stored, or disposed properly. A **waste analysis plan** outlines the procedures necessary to ensure proper treatment, storage, or disposal. The plan must be written, kept on site, and answer six basic questions:

- How will the TSDF know if the waste received is the same as that described on the manifest?
- Which waste constituents should the TSDF analyze?
- How should the samples be taken?
- What testing and analytical methods should the facility use?
- How often should the waste be retested?
- What are the acceptance and rejection criteria for each wastestream?

The waste analysis must be repeated periodically to ensure that the information on a given waste is accurate and current. At a minimum, the waste analysis must be repeated when the TSDF is notified or has reason to believe that the process or operation generating the hazardous waste has changed, and when inspection indicates that the hazardous waste received does not match the information on the accompanying manifest.

■ Security

Security provisions are intended to prevent accidental or unauthorized entry into the active portion of a facility (i.e., where hazardous waste is treated, stored, or disposed). Unless the TSDF owner and operator demonstrates to the implementing agency that livestock or unauthorized persons who enter the facility will not be harmed and will not interfere with compliance with the regulations, the facility must install the following security measures:

- A 24-hour surveillance system that continuously monitors and controls entry onto the active portion of the facility (e.g., television monitoring, guards)

OR

- An artificial or natural barrier (e.g., a fence) that completely surrounds the active portion of the facility and serves as a means to control entry to the active portion at all times through gates or entrances

- A sign reading: "Danger — Unauthorized Personnel Keep Out" at each entrance to the active portion. The sign must be written in English and any other language that is predominant in the area surrounding the facility. Alternative language conveying the same message may also be used.

■ Inspection Requirements

To make sure that the facility is operating properly, the TSDF owner and operator must visually inspect the facility for malfunction, deterioration, operator errors, and leaks. The inspections should follow a written inspection schedule developed and followed by the owner and operator. The schedule identifies the types of problems to be checked and how often inspections should be conducted. Areas where spills are more likely to occur, such as loading and unloading areas, must be inspected daily when in use. Unit-specific inspections or requirements also must be included in the schedule. The owner and operator must record inspections in a log or summary and must remedy any problems identified during inspections.

■ Personnel Training

To ensure that employees at the facility understand the risks posed by management of hazardous waste and are prepared to respond in case of an emergency, TSDF owners and operators must provide training. The training program must be completed six months from the date the facility is subject to the TSDF standards, or six months after the date a worker is newly employed. This training program must be reviewed annually.

■ Requirements For Ignitable, Reactive, or Incompatible Waste

To avoid dangerous accidents, fires, or explosions, special care must be taken in handling ignitable, reactive, or incompatible wastes. TSDF owners and operators handling ignitable and reactive wastes must be able to

demonstrate that these wastes are protected from ignition sources. Such protection includes "No Smoking" signs placed where ignitable and reactive wastes are stored, designation of separate smoking areas, and additional handling requirements. Similarly, owners and operators must take precautions against the combined storage of wastes that might react dangerously with one another, or with the unit in which they are stored. Such a reaction might be a fire or explosion, or the release of toxic dusts, gases, or fumes. To determine if particular wastes or storage units are compatible, the RCRA regulations list some common potentially incompatible wastes (40 CFR Part 264, Appendix V). For compatibility of wastes not listed in the regulations, the owner or operator may need to test the waste and the unit for compatibility.

■ Location Standards

Certain types of terrain may increase the dangers associated with managing hazardous waste. To protect people and the environment around these areas, RCRA imposes restrictions on where TSDFs can be built. The location standards for building new TSDFs include restrictions on siting TSDFs in floodplains or earthquake-sensitive areas. Additionally, TSDF owners and operators may not place noncontainerized or bulk liquid hazardous waste in a salt dome, salt bed formation, or underground mine or cave. Congress has granted one exception to this rule: DOE's Waste Isolation Pilot Project (WIPP) in New Mexico.

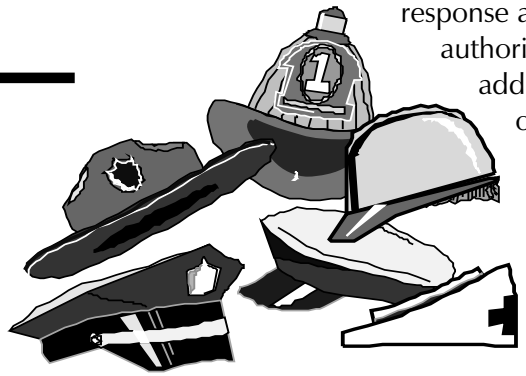
PREPAREDNESS AND PREVENTION

The preparedness and prevention standards are intended to minimize and prevent emergency situations at TSDFs, such as a fire, an explosion, or any unplanned release of hazardous waste or hazardous waste constituents to the air, soil, or surface water. These regulations require maintenance and routine testing of emergency equipment, alarms, minimum aisle space (to accommodate movement of personnel and equipment during emergencies), and provisions for contacting local authorities (police, fire department, hospitals, and emergency response teams) involved in emergency responses at the facility.

CONTINGENCY PLANS AND EMERGENCY PROCEDURES

Because emergencies cannot always be avoided, a TSDF must be prepared to respond. Contingency plans and emergency procedures provide the owner and operator with mechanisms to respond effectively to emergencies. The goal of these requirements is to minimize hazards resulting from fires, explosions, or any unplanned release of hazardous waste or constituents to air, soil, or surface water. To help guide these activities, the owner and operator must maintain a written contingency plan at the facility, and must carry out that plan immediately in the event of an emergency.

■ Contingency Plan



The contingency plan describes emergency response arrangements with local authorities and lists the names, addresses, and telephone numbers of all facility personnel qualified to work with local authorities as emergency coordinators. Where applicable, the plan might also include a list of emergency equipment and evacuation plans. If the owner

and operator has already prepared an emergency or contingency plan in accordance with other regulations (e.g., the Spill Prevention, Control, and Countermeasures (SPCC) rules as discussed in Section VI, Chapter 1), they can amend the existing plan to incorporate hazardous waste management provisions.

The contingency plan must be reviewed and amended when the applicable regulations or facility permits are revised, if the plan fails in an emergency, or when there are changes to the facility, the list of emergency coordinators, or the list of emergency equipment. A copy of the contingency plan (and any revisions) must be maintained at the facility and provided to all local authorities who may have to respond to emergencies.

■ Emergency Coordinator

To guide emergency response activities, the TSDF owner and operator must designate an emergency coordinator. The emergency coordinator is responsible for assessing emergency situations and making decisions on how to respond. There must be at least one employee either on the facility premises or on call with the authority to commit the resources needed to carry out the contingency plan.

■ Emergency Procedures

During an emergency, measures must be taken to ensure that fires, explosions, and releases do not occur, recur, or spread. In the event of an imminent or actual emergency situation, the emergency coordinator must immediately activate internal facility alarms or communication systems and notify appropriate state and local authorities. If the coordinator determines that the emergency threatens human health or the environment outside of the facility and finds that evacuation of local areas may be advisable, the coordinator must notify appropriate authorities, and either the designated government official for the area or the National Response Center.

MANIFEST, RECORDKEEPING, AND REPORTING

To keep track of hazardous waste activities, TSDF owners and operators must keep records and make reports to EPA. The manifest system tracks each off-site shipment of hazardous waste. The operating record and biennial report detail facility and waste management over time.

■ Manifest

When a waste shipment is received from off site, the TSDF owner and operator must sign and date all copies of the manifest to verify that the waste has reached the appropriate designated facility. The TSDF must keep a copy for its records and send a copy to the generator within 30 days to verify that the waste has been accepted. If the owner and operator of a TSDF must send the waste to another TSDF for further treatment or disposal, they must initiate a new manifest.

■ Operating Record

To keep track of hazardous waste activity at the facility, the owner and operator is required to keep, until the facility closes, a written operating record on site describing all waste received; methods and dates of treatment,

storage, and disposal; and the wastes' location within the facility. All information should be cross-referenced with the manifest number. Other information that the TSDF must keep in its operating record includes:

- Waste analysis results
- Details of emergencies requiring contingency plan implementation
- Inspection results (required to be kept for three years).

While most records may be kept on computer or microfiche, the TSDF owner and operator must keep original, signed copies of all manifests for inspection purposes. All records and plans must be available for inspection.

■ Biennial Report

To track hazardous waste activity nationwide, RCRA requires TSDFs to report to EPA the types and amounts of hazardous wastes generated, received, treated, stored, and disposed. TSDFs that generate hazardous waste through the course of on-site treatment, storage, or disposal must also describe waste minimization efforts taken to reduce the volume and toxicity of wastes generated, as well as describe the changes in volume or toxicity actually achieved, compared with those achieved in previous years. Reports are due to the EPA Regional Administrator on March 1 of each even-numbered year, and must detail the waste managed during the previous (odd-numbered) year. For example, the biennial report covering 1997 activities would be due March 1, 1998. Some states may require submission of such reports annually. Each owner and operator should consult their state agency for more specific biennial reporting information.

■ Additional Reports

Other reports that must be supplied to the implementing agency include, but are not limited to, reports of releases, fires and explosions, ground water contamination and monitoring data, and facility closure information. Spills may also trigger reporting requirements under CERCLA, and the Emergency Planning and Community Right-to-Know Act (EPCRA). (CERCLA and EPCRA are fully discussed in Section VI.)

STANDARDS FOR HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL UNITS

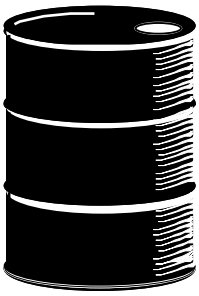
Hazardous waste managed at TSDFs may be treated, stored, or disposed of in several different types of units. In order to ensure that hazardous wastes are managed properly and in a safe manner, RCRA imposes design, construction, operation, maintenance, closure, and financial assurance requirements on hazardous waste management units.

Some of these units treat, store, or dispose of hazardous waste in or on the ground. Because these land-based units (i.e., land treatment units, landfills, surface impoundments, and waste piles) manage waste directly on the land, they have the potential to generate hazardous leachate that can pose a serious threat to soil, surface water, ground water, and human health and the environment.

To minimize the potential for leachate to threaten human health and the environment, EPA developed design and operating standards that use a combination of different technologies and good operating practices to detect, contain, and clean up any leaks that might occur.

Waste management not only has the potential to threaten ground water, surface water, and soil, but air as well. In order to minimize the risks that hazardous waste management poses to air, RCRA includes standards to control air emissions from certain hazardous waste management operations and units.

■ Containers



Containers are one of the most commonly used and diverse forms of hazardous waste storage. A container is any portable device in which a material is stored, transported, treated, or otherwise handled. Examples of hazardous waste containers include, but are not limited to: 55-gallon drums, large tanker trucks, railroad cars, small buckets, and test tubes. When EPA promulgated the unit-specific requirements for hazardous waste containers, the Agency emphasized that although mismanagement of containers has caused severe contamination in the past, relatively few regulations would be needed to ensure proper management. As a result, the container standards consist of very streamlined and basic management requirements.

Design Standards

Containers must be in good condition. Containers that are deteriorating (e.g., cracked, rusted, or leaking) cannot be used. Waste stored in defective containers must be transferred to containers in good condition or managed in another type of unit.

Operating Requirements

To prevent containers from spilling their contents, containers holding hazardous waste must be kept closed, except when adding or removing waste. In addition, containers must not be handled, opened, or stored in a way that might cause them to leak.

Inspections

In order to ensure that containers are being managed in compliance with these regulations, owners and operators must visually inspect container storage areas at least weekly for leaking and deteriorating containers.

Release Prevention and Response

To further prevent releases of hazardous waste into the environment, containers holding liquid hazardous wastes must have a secondary containment system. Secondary containment is emergency short-term storage designed to hold leaks from hazardous waste management units. An example of a secondary containment system is a sloped concrete pad that drains leaked waste into a tank. The secondary containment system must be free of cracks, able to contain the spill, and emptied quickly. Containers at interim status facilities do not have secondary containment requirements.

Special Wastes

When handled improperly, some wastes can ignite or explode. To protect communities near the facility from these dangers, containers holding ignitable or reactive wastes must be located at least 50 feet from the facility's property line.

Other Requirements

In addition to these requirements, containers storing or treating certain hazardous wastes are subject to RCRA air emission control requirements (as discussed later in this chapter). LQGs and SQGs accumulating waste in containers are subject to the interim status TSDF standards for these units. SQGs, however, are not subject to the air emission control requirements. (Generator requirements are fully discussed in Section III, Chapter 3.)

■ Containment Buildings

A **containment building** is a completely enclosed self-supporting structure (i.e., with four walls, a roof, and a floor) used to store or treat noncontainerized waste. Containment buildings are generally used for the management of hazardous waste debris and other bulky and high volume hazardous wastes, but may be employed for the management of any nonliquid hazardous waste.

Design Standards

The design standards for containment buildings stress structural soundness and hazardous waste leak prevention. To ensure that a containment building meets these standards, a professional engineer must certify that the unit is designed and installed according to the following specifications:

- The containment building must be completely enclosed with four walls, a floor, and a roof.
- The floor, walls, and roof must be constructed of man-made materials with enough strength to withstand movement of wastes, personnel, and heavy equipment within the building.
- Dust control devices, such as air-lock doors or negative air pressure systems (that pull air into the containment building) must also be used as necessary to prevent hazardous waste dust from escaping through these building exits.
- All surfaces in the containment building that come into contact with wastes during treatment or storage must be chemically compatible with such wastes. Incompatible wastes that might cause unit failure cannot be placed in containment buildings.

If the containment building is used to manage hazardous waste with visible liquids, or if waste treatment being conducted in the building requires the addition of liquids to the waste, the owner and operator must equip the unit with the following:

- A primary barrier constructed of materials to prevent migration of the waste into the barrier
- A liquid collection system to minimize standing liquids in the containment building and to facilitate liquid removal
- A leak detection system located immediately beneath the floor to indicate any weakness in the floor and leaks of hazardous waste from the unit
- A secondary barrier, such as a liner, constructed around the unit to contain any leaks and to facilitate cleanup before they reach nearby soils, surface water, or ground water. As with the unit floor, the secondary barrier must be structurally sound and chemically resistant to wastes and liquids managed in the containment building.

Some containment buildings designate certain areas (known as wet areas) for the management of liquid-containing wastes. Such buildings only need secondary containment for these wet areas, provided that waste liquids cannot migrate to the dry areas of the containment building.

Operating Requirements

Containment building operating requirements focus primarily on maintenance and inspection of the unit, recordkeeping requirements, and provisions for response to releases of hazardous waste. Among other requirements, owners and operators must:

- Maintain the floor so that it is free of significant cracks, corrosion, or deterioration
- Repair or replace surface coatings or liners that are subject to wear from movement of waste, personnel, or equipment as often as needed

- Limit the height of wastes piled within the unit
- Maintain dust control devices at all openings to prevent emissions from the unit
- Provide a decontamination area within the containment building (e.g., an area for washing vehicles and equipment prior to leaving the building) to prevent the tracking of waste out of the unit.

Inspections

Containment buildings must be inspected at least once every seven days, with all activities and results recorded in the operating log. During inspection, the owner and operator should evaluate the unit's integrity and assess nearby soils and surface waters to detect any signs of waste release. For purposes of these inspections, the owner and operator should also consider information from monitoring or leak detection equipment.

Release Prevention and Response

If a release is discovered during an inspection or at any time, the owner and operator must take the leaking portion of the unit out of service and take all appropriate steps to repair the leak and contain the released waste. The owner and operator must also notify the EPA Regional Administrator of the release and of the proposed schedule for repair of the unit. Upon completion of all necessary repairs and cleanup, a qualified, registered, professional engineer must verify, to the EPA Regional Administrator, that the facility complied with the plan.

Other Requirements

LQGs accumulating waste in containment buildings are subject to the interim status TSDF standards for these units. (Generator requirements are fully discussed in Section III, Chapter 3.)

■ Drip Pads

Drip pads are engineering structures consisting of a curbed, free-draining base, constructed of nonearthen materials, and designed to convey wood preservative chemical drippage from treated wood, precipitation, and surface water run-on to an associated collection system at wood preserving plants. In the wood preserving process, preservative solutions are commonly applied to wood products using a pressure treating process. Once the preservative solution has been applied to the wood, it is removed from the process unit and excess solution is allowed to drip from the wood onto drip pads. The pads collect the drippage (along with rainwater and surface water that has entered the pad) and collects it in a tank, container, or other such unit until the waste may be recycled, treated, or disposed of (see Figure III-10).

Design Standards

The various elements of a drip pad must be designed and constructed to handle the wastes managed on the unit and prevent those wastes from leaking into the environment.

Pad

The owner and operator of the drip pad must construct the pad of nonearthen materials (e.g., concrete, metal) and ensure that the pad is strong enough to prevent collapse, cracking, or other failure. The surface of the pad must have a raised barrier (called a berm) around the perimeter to prevent waste from running off the pad. It must be sloped to help the drippage flow into the collection unit, and must either be treated with impermeable sealers, coatings, or covers to prevent liquid from seeping into the base, or have a liner with a leak detection and collection system.

Liquid Collection System

The liquid collection system must be designed to prevent overflow, allow facility personnel to easily remove waste from the unit, and comply with the hazardous waste tank standards. Where applicable, the liquid collection system must also be protected from rain water running into and out of the unit.

Liner and Leak Detection System

The liners and leak detection system for drip pads do not have specific technical design criteria, but must be structurally sound and chemically compatible with the preservative drippage, and must be able to signal releases from the drip pad at the earliest practicable time.

Operating Requirements

Generally, a drip pad must be free of cracks and show no signs of corrosion or other types of deterioration. Drip pads must be cleaned frequently to allow for inspections of the entire drip pad surface without interference from accumulated wastes and residues. In addition to occasional cleaning, drippage and precipitation from the liquid collection system must be emptied as often as necessary to prevent the waste from flowing over the curb around the unit. All collection tanks must also be emptied as soon as possible after storms to ensure that they do not overflow back onto the pad. Lastly, owners and operators must minimize the tracking of hazardous waste by personnel and vehicles.

Inspections

Drip pads must be inspected weekly and after storms to ensure that the pad and the liquid collection systems are functioning properly and to check for deterioration of or leaks from the units. If, upon inspection, a drip pad shows any deterioration, the owner and operator must take the affected portion of the unit out of service for repairs before returning it to service.

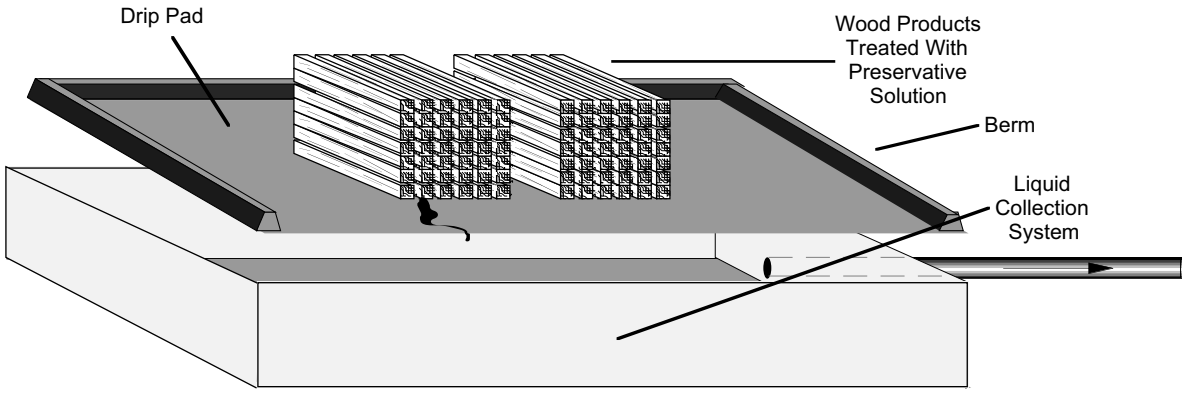
Other Requirements

LQGs accumulating waste on drip pads are subject to the interim status TSDF standards for these units. (Generator requirements are fully discussed in Section III, Chapter 3).

■ Land Treatment Units

Land treatment units, or land farms, are seldom-used land disposal units. Land treatment involves the application of waste on the soil surface, or the incorporation of waste into the upper layers of the soil in order to degrade, transform, or immobilize hazardous constituents present in hazardous waste. The waste is placed

Figure III-10: CROSS-SECTION OF A DRIP PAD



in the portion of the surface soil above the water table (or the highest point of the ground water flow) to let the soil microbes and sunlight degrade the hazardous waste. Because these units utilize biodegradation as a method of hazardous waste treatment thus necessitating certain operating and waste management conditions, the design and operating requirements for land treatment units are quite different from other waste management units.

Design Standards

Land treatment units must be equipped with run-on, run-off, and wind dispersion controls. Run-on and run-off controls prevent rain water and other liquids from running onto the unit (and creating leachate) and stop this leachate from running off the unit, thus carrying contaminants into surrounding soils, surface waters, and ground water. Wind dispersal controls prevent wind gusts from blowing small particles of hazardous waste off a land treatment unit into the air and surrounding soils and surface water. To prevent wind dispersal, owners and operators of land treatment units must apply a wind dispersal control, such as a cover, to the unit.

Operating Requirements

The operating requirements for land treatment units are intended to promote and maintain the biodegradation of hazardous wastes placed in the unit. Maintenance of proper soil pH, careful management of waste application rate, and control of surface water run-off are all key to the operation of a land treatment unit. The operation requirements include:

- Controls on the rate and method of waste application
- Measures to control soil acidity
- Measures to enhance microbial and chemical reactions
- Measures to control the moisture content of the area where wastes are treated.

Treatment Program and Demonstration

In order to guarantee that these waste treatment practices will be conducted to properly degrade the waste, owners and operators of land treatment units must design a treatment program that takes into account the characteristics of the site and the wastes to be handled. The owner and operator must then demonstrate to EPA the effectiveness of this plan. A treatment demonstration may involve field testing on a sample soil plot or laboratory testing. Interim status land treatment units are not required to establish a treatment program, but owners and operators can only place hazardous waste in the land treatment unit if the waste will be rendered nonhazardous or less hazardous.

Food Chain Crops

In some cases, an owner and operator may grow food-chain crops (crops grown for human consumption) in a land treatment unit. The Agency believes that this can be done safely if the owner and operator can demonstrate that hazardous constituents are not present in the crop in abnormally high levels. Additionally, if cadmium is present in the unit, the owner and operator must comply with additional management standards.

Inspections

The owner and operator must inspect the treatment area weekly and after storms to ensure that the unit is in compliance with the operating criteria. In addition, the owner and operator must establish a soil monitoring program. If there is significant evidence that the wastes in the unit are not responding to treatment and are sinking towards the water table, the owner and operator must notify the EPA Regional Administrator within

seven days, and modify the treatment program to ensure the sufficient treatment of hazardous constituents within the treatment zone.

Special Wastes

Certain types of hazardous wastes pose such a threat to human health and the environment that their management requires additional regulatory precautions. Considering the risks associated with the treatment, storage, and disposal of certain dioxin-containing hazardous wastes (F020, F021, F022, F023, F026, and F027), the RCRA regulations restrict the management of these wastes in land treatment units. As a result, owners and operators can only manage these wastes in a permitted land treatment unit in accordance with a special management plan approved by the EPA Regional Administrator. These wastes may not be handled in interim status land treatment units because these units do not meet the strict construction standards, and thus, may not be sufficiently protective.

■ Landfills

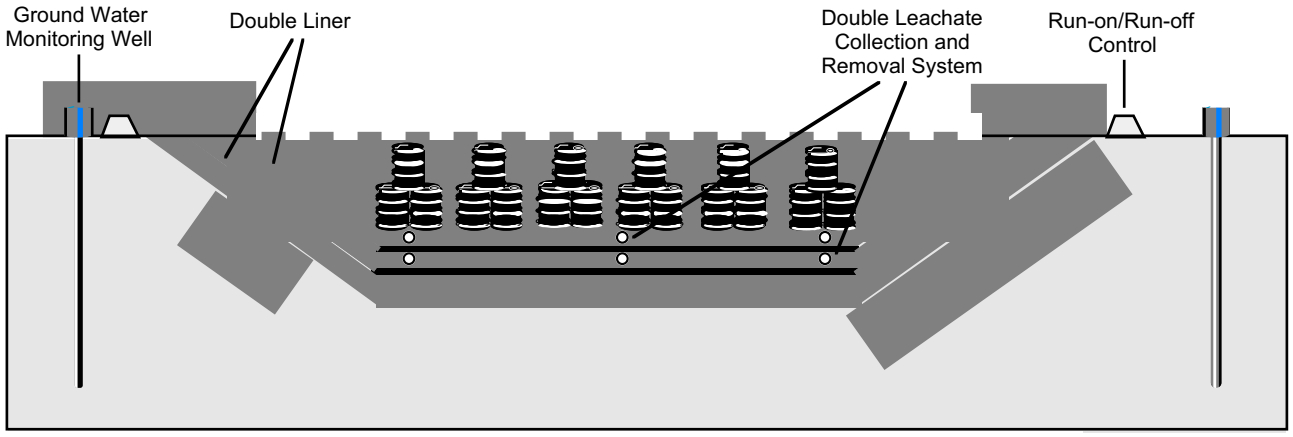
A **landfill** is a disposal unit where nonliquid hazardous waste is placed in or on the land. Landfills are the final disposal site, the ultimate grave, for a significant portion of the hazardous waste that is generated in the United States.

Design Standards

To minimize the potential for leachate to leak from a landfill, EPA developed the following design standards (see Figure III-11):

- Double liner
- Double leachate collection and removal system
- Leak detection system
- Run-on, run-off, and wind dispersal controls
- Construction quality assurance.

Figure III-11: CROSS-SECTION OF A LANDFILL



Double Liner

The double liner system has two components: a top liner and a composite bottom liner. The top liner, usually a synthetic material, keeps the liquid waste in the unit and prevents migration of hazardous leachate and waste into the liner. The composite bottom liner, consisting of a synthetic liner (made of a special kind of plastic) on top of three feet of compacted soil material, is designed to prevent any liquids that have leaked through the top liner from reaching underlying soils and ground water.

Double Leachate Collection and Removal System

Landfills must also be equipped with two leachate collection and removal systems. The first rests on the top liner, and the second between the top liner and the bottom composite liner. The top system collects any leachate that has filtered down through the waste in the unit and pumps it out to a collection tank, where it may be collected and disposed. The bottom system collects any leachate that has leaked through the top liner and similarly pumps it out to a collection tank, where it may similarly be collected and disposed.

Leak Detection System

While the lower leachate collection and removal system will continually remove the small amounts of liquid that might seep through the top liner, it may not be capable of handling a larger leak. Larger leaks can apply strong pressure on the bottom liner, potentially causing it to fail. To avoid this problem, RCRA requires that a leak detection system be installed within the leachate collection and removal system. This system must be able to detect when the flow rate into the leachate collection and removal system is above a normal operating range, and warn the owner and operator that the top liner may be leaking.

Run-On, Run-Off, and Wind Dispersal Controls

The run-on, run-off, and wind dispersal requirements are identical to those for land treatment units.

Construction Quality Assurance

None of these technologies are effective if the landfill is installed improperly or constructed of inferior materials. To ensure that a landfill meets all the technological requirements, EPA requires a **construction quality assurance** program. The program mandates a construction quality assurance plan that identifies how construction materials and their installation will be monitored and tested and how the results will be documented. The program must be developed and implemented under the direction of a registered professional engineer, who must also certify that the construction quality assurance plan has been successfully carried out and that the unit meets all specifications before any waste is placed into the unit.

Operating Requirements

In order to prevent the formation and migration of leachate in landfills, owners and operators may not place liquid hazardous wastes in a landfill, unless the wastes are in:

- Very small containers, such as ampules
- Containers, such as batteries, that contain small amounts of liquid for purposes other than storage
- **Lab packs** (drums filled with many small containers packed in nonbiodegradable absorbent materials).

Owners and operators may add nonbiodegradable absorbents to containers of liquid hazardous waste to remove any visible liquids. After all visible liquids have been removed, the owner and operator may then place the waste in a landfill.

Inspections

To ensure that the liners and leachate collection and removal systems are working properly, landfill owners and operators must:

- Inspect liners for any problems after construction or installation and continue inspections weekly and after storms to monitor for evidence of deterioration or damage
- Monitor leachate collection and removal system sumps at least weekly to measure the amount of liquid in the sumps and determine whether the upper liner might be leaking. This is designed to verify both the integrity of the liner and the efficiency of the leachate pump. If the level indicates a substantial leak, the owner and operator must notify EPA and respond in accordance with the facility's response action plan.

Release Prevention and Response

In order to prepare for a leak from a landfill, RCRA requires that owners and operators of hazardous waste landfills develop a response action plan. The response action plan outlines the short- and long-term actions to be taken in the event of a leak. A short-term action might involve shutting off the flow of hazardous waste into the landfill. A long-term action might involve emptying the unit and repairing or replacing the damaged liner or leachate collection and removal systems. As part of the plan, in the event of a leak, the owner and operator must notify the EPA Regional Administrator, determine what short-term actions must be taken, determine the location, size, and cause of any leak, and report the findings to the EPA Regional Office.

Special Wastes

Similar to land treatment units, permitted landfills can only treat, store, or dispose of certain dioxin-containing hazardous wastes (F020, F021, F022, F023, F026, and F027) if the unit has a special management plan approved by the EPA Regional Administrator. These wastes cannot be managed in interim status landfills.

Special Requirements for Certain Containers in Landfills

Over time, the hazardous waste containers placed in a landfill will decompose and collapse, creating air pockets under the landfill cover. When the wastes surrounding the container settle to fill the void, the liner may also settle. Such settling may cause the liner to stretch or tear. To prevent significant voids that could cause collapse of final covers and tearing of liners when containers erode and to maintain and extend available capacity in hazardous waste landfills, containers placed in a landfill must either be:

- At least 90 percent full

OR

- Crushed, shredded, or in some other way reduced in volume (unless they are very small containers, such as ampules).

■ Surface Impoundments

A **surface impoundment** is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it must be lined with man-made

materials) that is used to treat, store, or dispose of liquid hazardous waste. Examples include holding ponds, storage pits, and settling lagoons.

Design Standards

To minimize the potential for leachate to leak from a surface impoundment, EPA developed the following design standards (see Figure III-12):

- Double liner
- Leachate collection and removal system
- Leak detection system
- Dikes, berms, and freeboard
- Construction quality assurance.

Double Liner

The double liner system requirements are identical to those for hazardous waste landfills.

Leachate Collection and Removal System

The unit must be equipped with a leachate collection and removal system between the top liner and the bottom composite liner. The system collects any leachate that has leaked through the top liner and pumps it out to a collection tank. The system features a pump system and drainage layers to slow the flow of the leak. The system must be designed with a minimum bottom slope to help drainage, be made of materials that will not chemically react with the wastes placed in the unit, and be able to remove the liquids at a specified minimum rate.

Leak Detection System

The leak detection system requirements are identical to those for hazardous waste landfills.

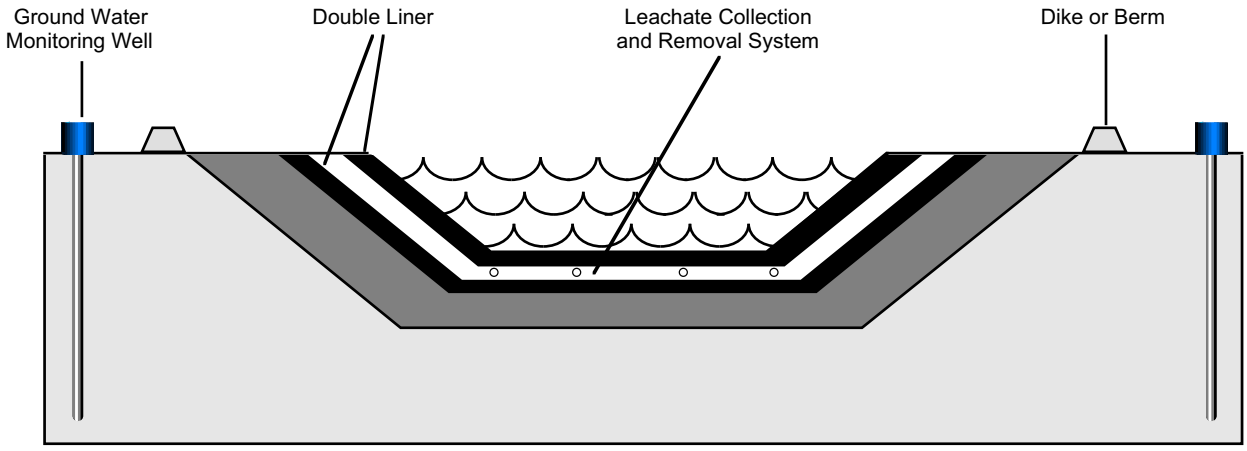
Dikes, Berms, and Freeboard

A surface impoundment must also be designed to prevent the flow of liquids over the top of an impoundment (overtopping). This is accomplished by constructing and maintaining dikes or berms (walls or man-made hills surrounding the unit) and ensuring a minimum distance (called freeboard) between the surface of the waste and the top of the impoundment to prevent overflow during high winds or rainstorms.

Construction Quality Assurance

The construction quality assurance program requirements are identical to those for hazardous waste landfills.

Figure III-12: CROSS-SECTION OF A SURFACE IMPOUNDMENT



Inspections

To ensure that the liners and leachate collection and removal system are working properly, owners and operators of hazardous waste surface impoundments must:

- Inspect liners and dikes or berms for any problems after construction or installation, and continue inspections weekly and after storms to monitor for evidence of deterioration, sudden drops in the level of the impoundment contents, and severe erosions of dikes and other containment devices

- Monitor leachate collection and removal system sumps at least weekly to measure the amount of liquid in the sump and determine whether the upper liner might be leaking. This is designed to verify both the integrity of the liner and the efficiency of the leachate pump. If the level indicates a substantial leak, the owner and operator must notify EPA and respond in accordance with the facility's response action plan.

Release Prevention and Response

The release prevention and response requirements are identical to those for hazardous waste landfills.

Special Wastes

Similar to land treatment units and landfills, permitted surface impoundments can only treat, store, or dispose of certain dioxin-containing hazardous wastes (F020, F021, F022, F023, F026, and F027) if the unit has a special management plan approved by the EPA Regional Administrator. These wastes cannot be managed in interim status surface impoundments.

Other Requirements

Other surface impoundment requirements include retrofitting provisions and air emissions requirements.

Surface Impoundment Retrofitting

Surface impoundments handling nonhazardous wastes are not subject to these extensive hazardous waste surface impoundment design and operating requirements. However, such impoundments may become subject to RCRA if the waste being handled in the unit becomes a hazardous waste as a result of a new hazardous waste listing or characteristic. In these cases, the owner and operator of the impoundment must retrofit the unit to meet the standards described above, or cease receipt of the hazardous waste and begin the closure process. Owners and operators have four years from the day that the listing or characteristic is finalized (in the *Federal Register*) to retrofit or close. For example, owners and operators of surface impoundments that became subject to RCRA as the result of the promulgation of the toxicity characteristic waste codes on March 29, 1990, were required to retrofit those units to meet the design and operating standards, or cease receipt of hazardous waste and begin closure by March 29, 1994.

These retrofitting requirements may be waived by the implementing agency under special circumstances. The impoundment must be designed, operated, and located in such a manner that there will be no migration of hazardous constituents into ground water or surface water at any time. Furthermore, the impoundment may contain only characteristic TC wastes. The implementing agency will determine on a site-specific basis whether a waiver from the retrofitting requirement is protective of human health and the environment.

Air Emissions

In addition to these requirements, surface impoundments storing, treating, or disposing of certain hazardous wastes are subject to RCRA air emission control requirements (as discussed later in this chapter).

■ Tanks

Tanks are stationary devices (as opposed to portable containers) used to store or treat hazardous waste. They are widely used for storage or accumulation of hazardous waste because they can accommodate huge volumes of material, sometimes in the tens of thousands of gallons. Tanks are used for the treatment of hazardous waste because of their structural strength and versatility. In order to ensure that a tank system can hold hazardous waste for its intended lifetime, a TSDF owner and operator must ensure that the tank is properly designed. RCRA requires that the tank system or components be designed with an adequate foundation, structural support, and protection from corrosion to prevent it from collapsing or leaking. In order to ensure that a tank is properly designed, an independent, qualified, registered, professional engineer must certify that the unit meets these requirements.

Design Standards

Hazardous waste tanks must be installed properly and designed to protect against corrosion.

Installation

Because even the most flawlessly designed tanks can fail if installed improperly, new tank systems must be inspected by an independent qualified expert prior to use to ensure that the tank was not damaged during installation. The owner and operator must repair any damage before the installation is complete or the system is in use. All new tanks and ancillary equipment must be tested to make sure that there are no leaks, and any leaks discovered must be fixed before the tanks are covered, enclosed, or placed in use.

Corrosion Protection

When metal tanks are in contact with soil or water, they can corrode and leak. To prevent leaks from corroded tanks, RCRA requires tanks made wholly or partly of metal to be designed and installed with adequate corrosion protection. To ensure that a tank is properly protected, an owner and operator must develop a written design plan. The design should take into account information specific to the site, such as soil moisture and acidity, that can affect the corrosion rate of the tank. The unit must have one or more of the following corrosion protection methods:

- Construction materials that are corrosion-resistant (e.g., fiberglass)
- Corrosion-resistant coating in combination with cathodic protection (cathodic protection prevents tanks from corroding by reversing the naturally occurring electric current in the ground that can degrade tank walls)
- Electrical isolation devices.

Existing tanks do not have to meet these requirements because of the high cost of installing corrosion protection on tanks that are already in the ground. On the other hand, owners and operators of existing tanks must assess the structural integrity of the units to ensure that they are designed and maintained to contain the wastes stored or treated within them without failing, collapsing, or rupturing. Such assessments must be certified by an independent, qualified, registered, professional engineer.

Operating Requirements

Hazardous waste tanks must be operated in a manner that minimizes or eliminates releases. Chemicals that may cause any part of the tank's system to fail may not be placed in the unit.

Because the loading or filling of tanks brings the potential for spills or releases of waste into the environment, such spills or overflows from the tank system must also be prevented by using, at a minimum:

- Spill prevention controls, such as valves designed to prevent the backflow of waste during fill-up of a tank
- Overfill prevention controls, such as alarms that sound when the waste level in the tank gets too high, and valve systems that automatically close when overfill is likely
- Sufficient room within an uncovered tank between the surface of the waste and the top of the tank (minimum freeboard).

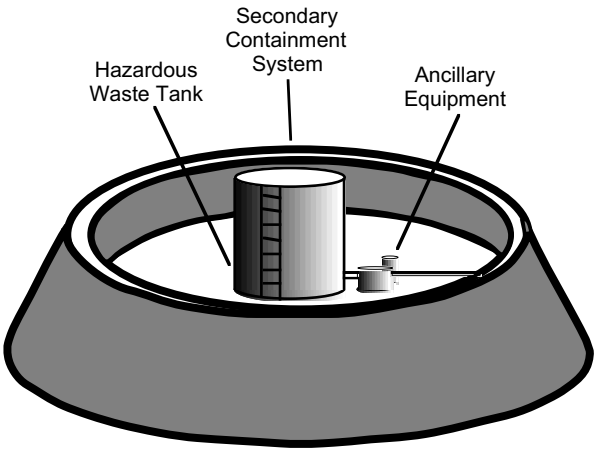
Inspections

To verify that hazardous waste tanks and components are operated and maintained in satisfactory condition, owners and operators must inspect their tanks daily. To meet these objectives, inspections must thoroughly identify leaks, deterioration, corrosion, or structural fatigue in any portion of the tank or system components. In addition to visual inspections, owners and operators must also take into account any data received from leak detection monitors and other tests.

Release Prevention and Response

The release response requirements require leak detection systems to detect leaks, and secondary containment devices to contain any leaks that might occur from the tank or ancillary equipment (see Figure III-13). All new hazardous waste tank systems must have leak detection and secondary containment before being placed in service. Existing systems must be equipped with secondary containment by different deadlines, based on a phased-in schedule determined by the age of the tank.

Figure III-13:
SECONDARY CONTAINMENT FOR TANKS



Leak Detection

Hazardous waste tanks must be equipped with a leak detection system. The leak detection system must be able to detect failure in either the main tank or secondary containment system generally within 24 hours. Thermal conductivity sensors, electrical resistivity sensors, and vapor detectors are commonly used leak detection devices. Daily visual inspections may also be used where tanks and tank components are physically accessible.

Secondary Containment

To make sure the tank system will perform properly, secondary containment systems must be designed, installed, and operated to ensure that:

- No waste is released to the surrounding soil, ground water, or surface water

- Construction materials or liners are compatible with the waste to be stored or treated in the tank
- The tank is capable of containing accumulated material until it is promptly removed (generally within 24 hours)
- The tank has sufficient structural strength to prevent failure
- The foundation can resist failure due to normal movement of the surrounding soils (settlement, compression, or uplift).

Owners and operators must meet these requirements by using one of the following secondary containment devices:

- An external liner that completely surrounds the unit with an impermeable material
- A vault (the tank rests in an underground chamber usually constructed with concrete floors and walls and an impermeable cover)
- A double-walled tank (the tank is completely enclosed inside another tank with a leak detection monitoring system installed between the two)
- An EPA-approved alternative design.

In addition to the tank itself, all ancillary equipment (e.g., pipes, valves, trenches connected to the tank or tank system) must have full secondary containment. Examples of secondary containment for ancillary equipment include lined trenches, and jacketed or double-walled piping. When inspected daily, however, the following equipment is exempt from this requirement:

- Aboveground piping (not including flanges, joints, valves, and connections)
- Welded flanges, welded joints, and welded connections
- Seal-less or magnetic coupling pumps
- Aboveground pressurized piping systems with automatic shut-off devices.

Despite these precautions, occasionally a tank system or secondary containment system will leak or spill hazardous waste. When this happens, the owner and operator must immediately take the tank out of operation and determine the cause of the release. To prevent the spill from moving further away from the tank, the owner and operator must also remove and properly dispose of any contaminated soil, ground water, or surface water. In addition, the owner and operator must notify the EPA Regional Administrator or National Response Center, and submit a follow-up written report to the EPA Regional Administrator within 30 days. The tank must then either be repaired or closed.

Other Requirements

In addition to these requirements, tanks storing or treating certain hazardous wastes are also subject to RCRA air emission control requirements (as discussed later in this chapter). LQGs and SQGs accumulating waste on site in tanks are subject to the interim status TSDF standards for these units. (Generator requirements are fully discussed in Section III, Chapter 3.) SQGs, however, are not subject to the air emission control requirements.

■ Waste Piles

A **waste pile** is an open pile used for treating or storing nonliquid hazardous waste. The standards for these units are very similar to those for landfills, but the difference is that waste piles may be used for temporary storage and treatment only, not disposal.