



ENVIRONMENTAL GUIDANCE REGULATORY BULLETIN

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Liners and Leak Detection Systems for Hazardous Waste Land Disposal Units

Final Rule Issued

On January 29, 1992, EPA published (57 *FR* 3462) regulations establishing new and amended standards for hazardous waste land disposal units under the Resource Conservation and Recovery Act (RCRA). The rule, which finalizes regulations proposed on March 28, 1986 (51 *FR* 10706) and May 29, 1987 (52 *FR* 20218), takes an important step in implementing EPA's groundwater policy by setting standards intended to minimize the potential for migration of hazardous constituents from hazardous waste land disposal units to underlying groundwater. The amended standards, promulgated in response to Sect. 3004(o)(5)(A) of RCRA, concern liner and leachate collection and removal system requirements for new and replacement surface impoundments, landfills, and waste piles and for lateral expansions of these units ("affected units"). Owners and operators of existing units will also have to meet new standards centering on the required installation of an approved leak

detection system as mandated by Sect. 3004(o)(4) of RCRA.

The rule applies to all affected units regardless of their permit status. For purposes of the rule, a *new unit* is defined as a unit for which construction begins after the promulgation date of the rule (i.e., January 29, 1992). However, the rule will not become effective until July 29, 1992, to allow owners and operators of new units to adjust their designs, if needed, and to submit appropriate documents to EPA prior to construction. A *replacement unit* is defined in the rule as a unit (1) from which all or substantially all of the waste is removed, and (2) that is subsequently reused to treat, store, or dispose of hazardous waste. The standards will apply to replacement units reused after the effective date of the rule.

The rule amends the current liner and leachate collection and removal system standards in Title 40 of the *Code of Federal Regulations*, Sects. 264.221(c), 264.301(c), 265.221(a), and 265.301(a). The revised standards require that affected units have a double liner and a leachate collection system to prevent hazardous constituents from migrating from the unit into groundwater or surface water. The top liner must be designed "to prevent the migration of hazardous constituents into such liner" during the unit's active life and post-closure period. The bottom liner is a composite. The upper component of the bottom liner must be designed and constructed of materials (e.g., a geomembrane) "to prevent the migration of hazardous constituents into this component during the active life and post-closure period." The lower component of the bottom liner must consist of at least 3 feet (91 cm) of compacted soil material having a hydraulic conductivity no greater than 1×10^{-7} cm/sec.

EPA evaluated current hazardous waste industry practices and available information in determining this double liner system as the best available technology to (1) maximize leachate detection, collection, and removal; and (2) prevent migration of hazardous constituents out of the unit. The liners used in a unit's design must be placed on a structurally stable foundation, chemically resistant to the waste in the unit, and cover all areas likely to be in contact with the waste.

The rule also requires owners and operators of regulated units to install and operate leak detection systems "capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post closure care period." EPA interprets "earliest practicable time" as the period between when a liquid passes through a breach in the top liner to the time a technology-based leak detection system can detect the liquid, assuming saturated, steady-state flow. Such a leak detection system is designated by EPA as the leachate collection and removal system drainage layer located immediately above the bottom composite liner. It will have to meet several design criteria as set forth in the rule. These criteria are:

- ❑ a minimum bottom slope of 1% or more,
- ❑ a minimum thickness of 12 inches (30.5 cm),
- ❑ a minimum hydraulic conductivity of 1×10^{-2} cm/sec for granular materials used for the drainage layer for waste piles and landfills and 1×10^{-1} cm/sec for granular materials used in surface impoundments,
- ❑ a minimum hydraulic transmissivity of 3×10^{-5} m²/sec for synthetic materials used in drainage layers for waste piles and landfills and 3×10^{-4} m²/sec for synthetic drainage materials used in surface impoundments, and

- ❑ certain sump design and operating requirements.

In addition to the core requirements EPA also promulgated several complementary standards in the rule to enhance the overall effectiveness of liners and leak detection systems at applicable units. One of these accompanying standards is the development of an approved response action plan by affected units' owners and operators to address the detection of a leakage rate greater than a pre-determined site-specific leakage rate, known as the action leakage rate (ALR). The ALR is the maximum design flow rate that the leak detection and removal system can remove without the fluid head on the bottom liner exceeding one foot.

The ALR must include an adequate margin of safety to account for uncertainties in the design, construction, operation, and location of the leak detection system. Other considerations such as waste and leachate characteristics must also be considered in specifying an ALR. To determine if the ALR for a unit has been exceeded, the owner or operator will have to convert the weekly or monthly flow rate, obtained by monitoring the leak detection sump, to an average daily flow rate for each sump. If the leakage rate becomes greater than the ALR, the response action plan of a unit will specify the corrective measures to be taken. Although the plan is to be site-specific, the rule requires several minimum response actions to be carried out including the following:

- ❑ notifying EPA within seven days of the determination that the ALR has been exceeded;
- ❑ submitting a preliminary written assessment to EPA within 14 days of the determination, as to the amount and source of liquids in the sump; possible location, size, and cause of the leak(s); and any short-term actions taken and/or planned;

- ❑ determining any other short-term and longer-term actions needed to be taken to mitigate or stop the leak(s); and
- ❑ determining whether the receipt of waste by the unit should cease or be curtailed and whether or not the unit should be closed.

To ensure the proper construction and design of double-liners and leak detection systems, the rule also requires affected owners and operators to establish a construction quality assurance (CQA) program to address the following physical components: (1) foundations, (2) dikes, (3) low-permeability soil liners, (4) geomembranes, (5) leachate collection and removal systems and leak detection systems, and (6) final cover systems.

The program will include the development of a site-specific CQA plan by a designated CQA officer who is a registered professional engineer. The plan will identify the steps to be implemented to monitor and document the quality of materials used and the methods of their installation in constructing applicable units. Specifically, inspections, observations, and tests will be required as part of the CQA plan to ensure that: (1) materials used conform with design and other material specifications; (2) all physical components are structural sound; and (3) physical components are constructed and installed in accordance with permit specifications, good engineering practices, and design specifications. The CQA program also must include a test fill for the compacted soil liners. The test fill is an area developed using the actual materials of construction for the compacted soil component of the bottom composite liner to ensure that it has a hydraulic conductivity of no more than 1×10^{-7} cm/sec. Affected units will not be able to receive waste until the owner or operator provides EPA with a certification signed by the CQA officer that the approved CQA plan has been carried out and that the unit meets the design and operating requirements of the rule.

Additional protective measures incorporated into the regulations include certain monitoring requirements, which apply mainly to the leak detection system. The rule requires the owner or operator to monitor for and record the amount of liquids removed from each leak detection sump at least once each week during the active life and closure period of the unit. After the final cover of a unit is installed, owners or operators will have to conduct monthly monitoring of the sump. However, the schedule for monitoring during post-closure may become less frequent (i.e., quarterly or semi-annual) if the liquid level in the sump stays below the pump operating level during consecutive monitoring periods.

Although the rule establishes specific design standards for liners and leak detection systems at affected units, EPA will allow the use of alternative designs that can be proven to achieve equal or better levels of performance. In allowing variances, EPA considered differences in site characteristics and the potential for improvement of technologies. It is important to note that EPA also provides exemptions from the design and operating requirements of the rule to any replacement unit if the existing unit was constructed in compliance with design standards under Sections 3004(o)(1) (A)(i) and (o)(5) of RCRA and if the liner is functioning as designed.

EPA will implement all of the provisions of this rule in states without final RCRA authorization status. With the exception of CQA requirements for final cover systems, the rule will be implemented by EPA in authorized states. However, authorized states must subsequently modify their programs to adopt equivalent regulations, including CQA/final cover requirements by July 1, 1993.

Please direct questions about this RCRA final rule on liners and leak detection systems for hazardous waste land disposal units to Mr. Jerry Coalgate, DOE Office of Environmental Guidance, RCRA/CERCLA Division, EH-231, 1000 Independence Ave., S.W., Washington, D.C., 20585, at FTS 896-6075 or (202) 586-6075.