7045.0538 LANDFILLS.

Subpart 1. **Scope.** This part applies to owners and operators of facilities that dispose of hazardous waste in landfills, except as part 7045.0450 provides otherwise.

Subp. 2. **Location.** Location requirements are as follows:

A. A landfill must not be located in an area characterized by surficial karst features.

B. The owner or operator of a proposed or existing landfill shall submit to the agency with the permit application a hydrogeologic report which provides sufficient information and detail on the site's topography, soils, geology, surface hydrology, and ground water hydrology to evaluate the facility's actual and potential effects on subsoils, surface water, and ground water. This report must include:

(1) a geologic history of the area;

(2) the stratigraphy of the area;

(3) the composition of the site's soil and rock formations;

(4) the hydraulic characteristics of the site's soil and rock formations;

(5) the occurrence of ground water in the area;

(6) directions and rates of ground water and surface water movements;

(7) ground water and surface water interactions;

(8) existing and future uses of ground water and surface water;

(9) existing quality of ground water and surface water;

(10) if a ground water monitoring system which complies with part 7045.0484, subpart 11, item A can be installed on the site;

(11) climatological information; and

(12) all other factors which would influence the quality and mobility of the leachate produced and the potential for it to migrate to subsoils, ground water, or surface water.

C. A landfill, including its underlying liners, must be located entirely above the seasonal high water table.

Subp. 3. **Design and operating requirements.** Design and operating requirements are as follows:

A. A landfill must have a double liner system that is designed, constructed, and installed to prevent any migration of wastes out of the landfill to the adjacent subsurface soil or ground water or surface water at any time during the active life, including the

closure and postclosure periods, of the landfill. The double liner system must consist of two liners with a leak detection, collection, and removal system. This system must be designed, constructed, maintained, and operated to detect, collect, and remove liquids without clogging, through the scheduled postclosure care period of the landfill. Both liners and the leak detection, collection, and removal system must conform to the requirements of item B or C, as appropriate, and must be:

(1) constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients, including static head and external hydrogeologic forces, physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(2) placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and

(3) installed to cover all surrounding earth likely to be in contact with the waste or leachate.

B. For any landfill that is not covered by item C or part 7045.0638, one of the liners may be constructed of materials that allow wastes to migrate into the liner, but not into the adjacent subsurface soil, drainage layer, or ground water or surface water. At least one liner must be constructed of materials that prevent wastes from passing into the liner. The double liner system must consist of two liners with a leak detection, collection, and removal system between the liners.

C. The owner or operator of each new landfill unit on which construction commences after January 29, 1992, each lateral expansion of a landfill unit on which construction commences after July 29, 1992, and each replacement of an existing landfill unit that is to commence reuse after July 29, 1992, must install two or more liners and a leachate collection and removal system above and between such liners. "Construction commences" and "existing facility" are defined in part 7045.0020.

(1) (a) The liner system must include:

i. a top liner designed and constructed of materials (e.g. a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life and postclosure care period; and

ii. a composite bottom liner, consisting of at least two components. The upper component 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 postclosure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper

component were to occur. The lower component must be constructed of at least three feet (91 centimeters) of compacted soil material with a hydraulic conductivity of no more than 1 x 10 to the negative 7th centimeters per second.

(b) The liners must comply with item A.

(2) The leachate collection and removal system immediately above the top liner must be designed, constructed, operated, and maintained to collect and remove leachate from the landfill during the active life and postclosure care period. The commissioner will specify design and operating conditions in the permit to ensure that the leachate depth over the liner does not exceed 30 centimeters (one foot). The leachate collection and removal system must comply with subitem (3), units (c) and (d).

(3) The leachate collection and removal system between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a leak detection system. This leak detection system must be 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 postclosure care period. The requirements for a leak detection system in this subitem are satisfied by installation of a system that is, at a minimum:

(a) constructed with a bottom slope of one percent or more;

(b) constructed of granular drainage materials with a hydraulic conductivity of 1 x 10 to the negative 2nd centimeters per second or more and a thickness of 12 inches (30.5 centimeters) or more; or constructed of synthetic or geonet drainage materials with a transmissivity of 3 x 10 to the negative 5th meters squared per second or more;

(c) constructed of materials that are chemically resistant to the waste managed in the landfill and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and equipment used at the landfill;

(d) designed and operated to minimize clogging during the active life and postclosure care period; and

(e) constructed with sumps and liquid removal methods (e.g. pumps) of sufficient size to collect and remove liquids from the sump and prevent liquids from backing up into the drainage layer. Each unit must have its own sump. The design of each sump and removal system must provide a method for measuring and recording the volume of liquids present in the sump and of liquids removed.

(4) The owner or operator shall collect and remove pumpable liquids in the leak detection system sumps to minimize the head on the bottom liner.

(5) The owner or operator of a leak detection system that is not located completely above the seasonal high water table must demonstrate that the operation of the leak detection system will not be adversely affected by the presence of groundwater.

D. A landfill must have a leachate collection and removal system immediately above each liner that is designed, constructed, maintained, and operated to collect and remove leachate from the landfill. The agency shall specify design and operating conditions in the permit to ensure that the leachate depth over each liner does not exceed 30 centimeters (one foot) at any point. The leachate collection and removal systems must be:

(1) constructed of materials that are chemically resistant to the waste managed in the landfill and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by any equipment used at the landfill; and

(2) designed, constructed, maintained, and operated to function without clogging through the scheduled postclosure care period of the landfill.

E. The owner or operator shall design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the landfill during peak discharge from at least a 100-year storm.

F. The owner or operator shall design, construct, operate, and maintain a runoff management system to collect and control at least the water volume resulting from a 24-hour, 100-year storm.

G. Collection and holding facilities such as tanks or basins, associated with run-on and runoff control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.

H. The owner or operator shall cover or otherwise manage the landfill to control wind dispersal of particulate matter.

I. The owner or operator shall develop the landfill in appropriately sized cells to minimize the amounts of liquids entering each cell due to precipitation.

J. The owner or operator of a landfill shall submit to the agency with the permit application a plan for the treatment and disposal of runoff contained in the runoff management system and leachate which is removed from the landfill.

K. An owner or operator may petition for alternate design or operating practices under part 7045.0075, subpart 12.

L. The agency shall specify in the permit all design and operating practices that are necessary to ensure that the requirements of items A to K are satisfied.

M. The commissioner shall approve alternative design or operating practices to those specified in item C if the owner or operator demonstrates to the commissioner that such design and operating practices, together with location characteristics:

(1) will prevent the migration of any hazardous constituent into the groundwater or surface water at least as effectively as the liners and leachate collection and removal systems specified in item C; and

(2) will allow detection of leaks of hazardous constituents through the top liner at least as effectively.

N. The owner or operator of any replacement landfill unit is exempt from item C if:

(1) the existing unit was constructed in compliance with the design standards of the United States Resource Conservation and Recovery Act, section 3004(o)(1)(A)(i) and (o)(5); and

(2) there is no reason to believe that the liner is not functioning as designed.

Subp. 4. **Leak detection.** If liquids are detected in the leak detection, collection, and removal system, the owner or operator shall notify the commissioner of that fact in writing within seven days after detecting the liquids, and:

A. within a period of time specified in the permit, remove accumulated liquids, repair or replace any liner which is leaking to prevent the migration of liquids through the liner, and obtain a certification from a qualified engineer that, to the best of his or her knowledge and opinion, the leak has been stopped; or

B. if the owner or operator can demonstrate to the commissioner that the repair of the liner is not possible or feasible, he or she must begin to comply with the monitoring requirements of part 7045.0484, subpart 12, item E within a period of time specified in the permit.

The agency will specify in the permit all design and operating practices that are necessary to ensure that the requirements of item A or B are satisfied.

Subp. 4a. **Action leakage rate.**

A. The commissioner shall approve an action leakage rate for landfill units subject to subpart 3, item C or K. The action leakage rate is the maximum design flow rate that the leak detection system can remove without the fluid head on the bottom liner exceeding one foot. The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction, operation, and location of the leak detection system, waste and leachate characteristics, likelihood and amounts of other sources of liquids in the leak detection system, and proposed response actions (e.g., the action leakage rate must

consider decreases in the flow capacity of the system over time resulting from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.).

B. To determine if the action leakage rate has been exceeded, the owner or operator must convert the weekly or monthly flow rate from the monitoring data obtained under subpart 5, item C, to an average daily flow rate (gallons per acre per day) for each sump. Unless the commissioner approves a different calculation, the average daily flow rate for each sump must be calculated weekly during the active life and closure period, and monthly during the postclosure care period when monthly monitoring is required under subpart 5, item C.

Subp. 5. **Monitoring and inspection.** Monitoring and inspection requirements are as follows:

A. During construction or installation, liners and cover systems such as membranes, sheets, or coatings, must be inspected for uniformity, damage, and imperfections such as holes, cracks, thin spots, or foreign materials. Immediately after construction or installation:

(1) synthetic liners and covers must be inspected to ensure tight seams and joints and the absence of tears, punctures, or blisters;

(2) soil-based and admixed liners and covers must be inspected for imperfections including lenses, cracks, channels, root holes, or other structural nonuniformities that may cause an increase in the permeability of the liner or cover; and

(3) the construction of the liners must be certified by a qualified engineer to be in accordance with the approved plans and specifications.

B. While a landfill is in operation, it must be inspected weekly and after storms to detect evidence of any of the following:

(1) deterioration, malfunctions, or improper operation of run-on and runoff control systems;

(2) the presence of liquids in leak detection systems;

(3) improper functioning of wind dispersal control systems, where present; and

(4) the presence of leachate in and proper functioning of leachate collection and removal systems.

If any evidence of any condition described in subitems (1) to (3) is detected, the owner or operator shall notify the commissioner of the condition and remedies to correct the condition.

C. (1) An owner or operator required to have a leak detection system under subpart 3, item C or K, must record the amount of liquids removed from each leak detection system sump at least once each week during the active life and closure period.

(2) After the final cover is installed, the amount of liquids removed from each leak detection system sump must be recorded at least monthly. If the liquid level in the sump stays below the pump operating level for two consecutive months, the amount of liquids in the sumps must be recorded at least quarterly. If the liquid level in the sump stays below the pump operating level for two consecutive quarters, the amount of liquids in the sumps must be recorded at least semiannually. If at any time during the postclosure care period the pump operating level is exceeded at units on quarterly or semiannual recording schedules, the owner or operator must return to monthly recording of amounts of liquids removed from each sump until the liquid level again stays below the pump operating level for two consecutive months.

(3) "Pump operating level" is a liquid level proposed by the owner or operator and approved by the commissioner based on pump activation level, sump dimensions, and level that avoids backup into the drainage layer and minimizes head in the sump.

Subp. 5a. **Response actions.**

A. The owner or operator of landfill units subject to subpart 3, item C or K, must have an approved response action plan before receipt of waste. The response action plan must set forth the actions to be taken if the action leakage rate has been exceeded. At a minimum, the response action plan must describe the actions specified in item B.

B. If the flow rate into the leak detection system exceeds the action leakage rate for any sump, the owner or operator must:

(1) notify the commissioner in writing of the exceedence within seven days of the determination;

(2) submit a preliminary written assessment to the commissioner within 14 days of the determination, as to the amount of liquids, likely sources of liquids, possible location, size, and cause of any leaks, and short-term actions taken and planned;

(3) determine to the extent practicable the location, size, and cause of any leak;

(4) determine whether waste receipt should cease or be curtailed, whether any waste should be removed from the unit for inspection, repairs, or controls, and whether or not the unit should be closed;

(5) determine any other short-term and longer-term actions to be taken to mitigate or stop any leaks; and

(6) within 30 days after the notification that the action leakage rate has been exceeded, submit to the commissioner the results of the analyses specified in subitems (3) to (5), the results of actions taken, and actions planned. Monthly thereafter, as long as the flow rate in the leak detection system exceeds the action leakage rate, the owner or operator must submit to the commissioner a report summarizing the results of any remedial actions taken and actions planned.

C. To make the leak and/or remediation determinations in item B, subitems (3) to (5), the owner or operator must:

(1) (a) assess the source of liquids and amounts of liquids by source;

(b) conduct a fingerprint, hazardous constituent, or other analyses of the liquids in the leak detection system to identify the source of liquids and possible location of any leaks, and the hazard and mobility of the liquid; and

(c) assess the seriousness of any leaks in terms of potential for escaping into the environment; or

(2) document why such assessments are not needed.

Subp. 6. **Surveying and record keeping.** The owner or operator of a landfill shall maintain the following items in the operating record required under part 7045.0478:

A. on a map, the exact location and dimensions, including depth, of each cell with respect to permanently surveyed benchmarks; and

B. the contents of each cell and the approximate location of each hazardous waste type within each cell.

Subp. 7. **Closure and postclosure care.** Closure and postclosure care requirements are as follows:

A. At final closure of the landfill and upon closure of any cell, the owner or operator shall cover the landfill or cell with a final cover designed and constructed to:

(1) provide long-term minimization of migration of liquids through the closed landfill;

(2) function with minimum maintenance;

(3) promote drainage and minimize erosion or abrasion of the cover;

(4) accommodate settling and subsidence so that the cover's integrity is maintained; and

(5) have a permeability less than or equal to the permeability of any bottom liner system.

B. After final closure, the owner or operator shall comply with all postclosure requirements contained in parts 7045.0488 to 7045.0494 including maintenance and monitoring throughout the postclosure care period specified in the permit under part 7045.0488. The owner or operator shall:

(1) maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;

(2) maintain and monitor the leak detection system in accordance with subparts 3 and 4;

(3) continue to operate the leachate collection and removal systems;

(4) maintain and monitor the leak detection system in accordance with subparts 3, item C, subitems (3), unit (d), and (4); and 5, item C, and comply with all other applicable leak detection system requirements of parts 7045.0450 to 7045.0551 governing facility standards;

(5) maintain and monitor the groundwater monitoring systems and comply with all other applicable requirements of part 7045.0484;

(6) prevent run-on and runoff from eroding or otherwise damaging the final cover;

(7) protect and maintain surveyed benchmarks used in complying with subpart 6; and

(8) survey the landfill at least annually to determine any effects from settling, subsidence, erosion, or other events.

C. During the postclosure care period, if liquids are detected in a leak detection system, the owner or operator shall:

(1) notify the commissioner of that fact in writing within seven days after detecting the liquids; and

(2) remove accumulated liquids and begin to comply with the monitoring requirements of part 7045.0484, subpart 12, item E within a time specified in the permit.

Subp. 8. **Special requirements for ignitable or reactive waste.** Special requirements for ignitable or reactive waste are as follows:

A. Except as provided in item B and subpart 12, ignitable or reactive waste must not be placed in a landfill, unless the waste and landfill meet all applicable requirements of part 7045.1390, and the resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable or reactive waste under part 7045.0131, subpart 2 or 5, and compliance with part 7045.0456, subpart 2 is maintained.

B. Except for prohibited wastes which remain subject to treatment standards in Code of Federal Regulations, title 40, sections 268.40 to 268.42, as incorporated in part 7045.1390, ignitable wastes in containers may be landfilled without meeting the requirements of item A, provided that the wastes are disposed of in such a way that they are protected from any material or conditions which may cause them to ignite. At a minimum, ignitable wastes must be disposed of in nonleaking containers which are carefully handled and placed so as to avoid heat, sparks, rupture, or any other condition that might cause ignition of the wastes; must be covered daily with soil or other noncombustible material to minimize the potential for ignition of the wastes; and must not be disposed of in cells that contain or will contain other wastes which may generate heat sufficient to cause ignition of the waste.

Subp. 9. **Special requirements for incompatible wastes.** Incompatible wastes, or incompatible wastes and materials must not be placed in the same landfill cell unless compliance with part 7045.0456, subpart 2 is maintained.

Subp. 10. **Special requirements for liquid waste.** Special requirements for liquid waste are as follows:

A. The placement in any landfill of bulk or noncontainerized liquid hazardous waste or waste containing free liquids, whether or not sorbents have been added, is prohibited.

B. Containers holding free liquids must not be placed in a landfill unless:

(1) all free-standing liquid has been removed by decanting, or other methods; has been mixed with sorbent or solidified so that freestanding liquid is no longer observed; or has been otherwise eliminated;

(2) the container is very small, such as an ampoule; or

(3) the container is a laboratory pack as defined in subpart 12 and is disposed of in accordance with subpart 12.

C. To demonstrate the absence or presence of free liquids in either a containerized or a bulk waste, the following test must be used: Method 9095 (Paint Filter Liquids Test) as described in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA publication SW-846, incorporated in part 7045.0065, item D.

D. Sorbents used to treat free liquids to be disposed of in landfills must be nonbiodegradable. Nonbiodegradable sorbents are materials listed or described in subitem (1) or materials that pass one of the tests in subitem (2).

(1) Nonbiodegradable sorbents:

(a) inorganic minerals, other inorganic materials, and elemental carbon (for example, aluminosilicates, clays, smectites, Fuller's earth, bentonite, calcium bentonite,

montmorillonite, calcined montmorillonite, kaolinite, micas (illite), vermiculites, and zeolites; calcium carbonate (organic free limestone); oxides/hydroxides, alumina, lime, silica (sand), and diatomaceous earth; perlite (volcanic glass); expanded volcanic rock; volcanic ash; cement kiln dust; fly ash; rice hull ash; and activated charcoal/activated carbon);

(b) high molecular weight synthetic polymers (for example, polyethylene, high density polyethylene (HDPE), polypropylene, polystyrene, polyurethane, polyacrylate, polynorborene, polyisobutylene, ground synthetic rubber, cross-linked allylstyrene, and tertiary butyl copolymers). This does not include polymers derived from biological material or polymers specifically designed to be degradable; or

(c) mixtures of these nonbiodegradable materials.

(2) Tests for nonbiodegradable sorbents must use the following methods. The methods and tests in this subitem are incorporated by reference, are not subject to frequent change, and are available through the Minitex interlibrary loan system:

(a) the sorbent material is determined to be nonbiodegradable under ASTM Method G21-70 (1984a), Standard Practice for Determining Resistance of Synthetic Polymer Materials to Fungi;

(b) the sorbent material is determined to be nonbiodegradable under ASTM Method G22-76 (1984b), Standard Practice for Determining Resistance of Plastics to Bacteria; or

(c) the sorbent material is determined to be nonbiodegradable under OECD test 301B: CO_2 Evolution (Modified Sturm Test).

Subp. 11. **Special requirements for containers.** Unless they are very small, such as an ampule, containers must be either:

A. at least 90 percent full when placed in the landfill; or

B. crushed, shredded, or similarly reduced in volume to the maximum practical extent before burial in the landfill.

Subp. 12. **Disposal of small containers of hazardous waste in overpacked drums.** Small containers of hazardous waste in overpacked drums, or laboratory packs, may be placed in a landfill if the requirements of items A to F are met:

A. Hazardous waste must be packaged in nonleaking inside containers. The inside containers must be of a design and constructed of a material that will not react dangerously with, be decomposed by, or be ignited by the contained waste. Inside containers must be tightly and securely sealed. The inside containers must be of the size and type authorized in the United States Department of Transportation hazardous materials regulations under

Code of Federal Regulations, title 49, parts 173, 178, 179, and 180, as amended, if those regulations specify a particular inside container for the waste.

B. The inside containers must be overpacked in a removable head metal shipping container as specified in the United States Department of Transportation regulations under Code of Federal Regulations, title 49, section 173.12 and parts 178, 179, and 180, as amended. The inside containers must be surrounded by, at a minimum, a sufficient quantity of chemically compatible sorbent material, determined to be nonbiodegradable in accordance with subpart 10, item D, to completely sorb all of the liquid contents of the inside containers. The gross weight of the complete package must not exceed 205 kilograms (452 pounds). The metal outer container must be full after it has been packed with inside containers and sorbent materials.

C. The sorbent material used must not be capable of reacting dangerously with, being decomposed by, or being ignited by the contents of the inside containers, in accordance with part 7045.0456, subpart 2.

D. Incompatible wastes, as defined in part 7045.0020 must not be placed in the same outside container.

E. Reactive wastes, other than cyanide- or sulfide-bearing waste as defined in part 7045.0131, subpart 5, item E, must be treated or rendered nonreactive prior to packaging in accordance with items A to D. Cyanide- and sulfide-bearing reactive waste may be packed in accordance with item A to D without first being treated or rendered nonreactive.

F. The disposal is in compliance with part 7045.1390. Persons who incinerate lab packs in accordance with Code of Federal Regulations, title 40, section 268.42, as incorporated in part 7045.1390, may use fiber drums in place of metal outer containers. The fiber drums must meet United States Department of Transportation specifications in Code of Federal Regulations, title 49, section 173.12, as amended, and be overpacked in accordance with item B.

Subp. 13. **Special requirements for hazardous wastes F020, F021, F022, F023, F026, F027, and F028.** The following requirements apply to the hazardous wastes indicated:

A. Hazardous wastes F020, F021, F022, F023, F026, and F027 listed under part 7045.0135, subpart 1a, item B, must not be placed in a landfill.

B. Hazardous waste F028 and treatment residues and soils contaminated with hazardous wastes F020, F021, F022, F023, F026, F027, and F028 listed under part 7045.0135, subpart 1a, item B, must not be managed at landfills unless the owner or operator operates the landfill in accordance with all applicable requirements of this part and

in accordance with a management plan that is approved by the commissioner considering the following factors:

(1) the volume, physical, and chemical characteristics of the wastes, including their potential to migrate through soil or to volatilize or escape into the atmosphere;

(2) the attenuative properties of underlying and surrounding soils or other materials;

(3) the mobilizing properties of other materials codisposed with these wastes; and

(4) the effectiveness of additional treatment, design, or monitoring techniques.

C. The commissioner shall impose additional design, operating, and monitoring requirements if the commissioner finds that the additional requirements are necessary for landfills used to dispose of hazardous waste F028 and treatment residues and soil contaminated with hazardous wastes F020, F021, F022, F023, F026, F027, and F028 listed under part 7045.0135, subpart 1a, item B, in order to reduce the possibility of migration of these wastes to ground water, surface water, or air so as to protect human health and the environment.

Statutory Authority: *MS s 116.07; 116.37*

History: *9 SR 115; 10 SR 1212; 11 SR 1832; L 1987 c 186 s 15; 15 SR 1877; 16 SR 2239; 18 SR 1886; 20 SR 715; 33 SR 2042*

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