Kansas Administrative Regulations

Department of Health and Environment

Article 29.—Solid Waste Management—Part 7. Municipal Solid Waste Landfills.

28-29-104. Design standards.

(a) General design standards.

(1) Existing units. Any portion of a trench or area of an existing unit not filled to its permitted design capacity by October 9, 1996, shall be considered a vertical expansion subject to the standards in K.A.R. 28-29-104(a)(2), or a new unit subject to the standards in K.A.R. 28-29-104(a)(3).

(2) Vertical expansions.

(A) Any proposed vertical expansion shall be considered a significant modification to the facility and subject to permit modification procedural requirements.

(B) Any proposed vertical expansion shall meet the following requirements, in addition to any other applicable MSWLF regulations.

(i) A hydrogeologic site assessment shall be conducted in compliance with K.A.R. 28-29-104(b).

(ii) A groundwater monitoring well system shall be in place, pursuant to K.A.R. 28-29-111.

(iii) The owner or operator shall operate the landfill in a manner that minimizes leachate generation.

(iv) If groundwater contamination is detected, the owner or operator of the proposed vertical expansion shall initiate an assessment of corrective measures, pursuant to K.A.R. 28-29-114(a)(1).

(v) The final cover design shall meet the requirements of K.A.R. 28-29-121(e)(1).

(vi) Local planning and zoning approval shall be obtained from the appropriate jurisdictional body.

(vii) The owner or operator shall secure certification from the board of county commissioners that the vertical expansion is in conformance with the official county or regional solid waste management plan.

(C) A vertical expansion over a closed unit which has received final cover shall be classified as a new unit, and therefore subject to the design standards for new units.

(D) In evaluating a proposed vertical expansion, the department shall consider the following factors:

(i) The impact of the proposed vertical expansion on human health and the environment rather than other alternatives, including a new unit;

(ii) the capacity needs of the community or communities and the region using the landfill;

(iii) the proposed operating life of the vertical expansion; and

(iv) the inclusion or exclusion of the landfill in a regional solid waste management plan.

(E) The expiration date for a permit modified to allow for a vertical expansion shall not exceed five years from the date the modified permit is issued. At the end of the initial five year period, and any subsequent five year period, the owner may submit a request for an additional five-year permit. The request shall include an assessment of the environmental impact of the vertical expansion. Based on an evaluation of the environmental impact, the permit shall either be denied, or renewed for a period not to exceed five additional years by the director.

(3) New units.

(A) All new units shall be equipped with a leachate drainage and collection system and liner designed as an integrated system in compliance with the requirements of this section.

(B) The design period for new municipal landfills shall be the estimated operating life plus 30 years of post-closure care.

(b) Hydrogeologic site investigations.

(1) The owner or operator of a proposed MSWLF unit shall conduct a hydrogeologic investigation to develop information for the following purposes:

(A) providing information to determine an appropriate design for the unit; and

(B) providing information to establish a groundwater monitoring system.

(2) Prior to submitting an application to the department for a permit to develop and operate a MSWLF or to design a groundwater monitoring system, the hydrogeologic site investigation shall be conducted in a minimum of two phases, unless the department approves conducting the two phases concurrently.

(A) The purpose of the phased study shall be to allow for the consideration by the department of information gathered during phase I prior to proceeding with phase II.

(B) If the owner or operator of an existing MSWLF has already compiled sufficient data to fulfill the requirements of the hydrogeologic investigation, this information may be submitted to the department in lieu of conducting a new assessment.

(3) For the purposes of the hydrogeologic investigation set forth in paragraph (b)(1), the area to be investigated shall consist of the entire area occupied by the facility and any adjacent areas, if necessary to fully characterize the site.

(4) All borings shall be sampled continuously except where continuous sampling is impossible or where interval sampling or sampling at recognizable points of geologic variation will provide satisfactory information. Sampling intervals shall not exceed 1.52 vertical meters (5 feet).

(5) The phase I hydrogeologic investigation shall consist of the following items.

(A) A minimum of one continuously sampled boring shall be drilled on the site, as close as possible to the geographic center, to determine if available regional hydrogeologic setting information is accurate and to characterize the site-specific hydrogeology to the extent specified by this phase of the investigation. The boring shall extend to the bottom of the uppermost aquifer. This boring shall be constructed so that it will not provide a conduit for contaminant migration to a lower aquifer or formation.

(B) The following information shall be gathered by the owner or operator:

(i) climatic aspects of the study area;

(ii) the regional and study area geologic and hydrogeologic setting, including a description of the geomorphology and stratigraphy of the area and aquifer characteristics, including water table depths; and

(iii) any other information needed for the purpose of designing a phase II hydrogeologic investigation.

(C) The information from the phase I investigation shall be compiled in a report and submitted with evaluations and recommendations to the department for review and approval.

(D) The results and conclusions of the phase I report shall be certified by a qualified groundwater scientist.

(6) The phase II hydrogeologic investigation shall consist of the following items.

(A) One boring shall be located as close as possible to the topographical high point, and another shall be located as close as possible to the topographical low point of the study area.

(B) Additional borings shall be made in order to characterize the subsurface geology of the entire study area.

(C) Piezometers and groundwater monitoring wells shall be established to determine the direction and flow characteristics of the groundwater in all strata and extending down to the bottom of the uppermost aquifer. Groundwater samples taken from the monitoring wells shall be used to develop preliminary information needed for establishing background concentrations.

(D) The owner or operator shall gather the following site-specific information, as necessary, to augment the data collected during the phase I investigation:

(i) chemical and physical properties including, but not limited to, lithology, mineralogy, and hydraulic characteristics of underlying strata including those below the uppermost aquifer;

(ii) soil characteristics, including soil types, distribution, geochemical and geophysical characteristics;

(iii) hydraulic conductivities of the uppermost aquifer and all strata above it;

(iv) vertical extent of the uppermost aquifer;

(v) direction and rate of groundwater flow; and

(vi) concentrations of chemical constituents present in the groundwater below the unit, down to the bottom of the uppermost aquifer, using a broad range of chemical analysis and detection procedures such as gas chromatographic and mass spectrometric scanning.

(E) The owner or operator shall evaluate the data gathered during the phase I and phase II investigations and prepare a report for submittal to the department that contains the following information:

(i) structural characteristics and distribution of underlying strata, including bedrock;

(ii) characterization of potential pathways for contaminant migration;

(iii) correlation of stratigraphic units between borings;

(iv) continuity of petrographic features including, but not limited to, sorting, grain size distribution, cementation and hydraulic conductivity;

(v) identification of the confining layer, if present;

(vi) characterization of the seasonal and temporal, naturally and artificially induced, variations in groundwater quality and groundwater flow;

(vii) identification of unusual or unpredicted geologic features, including fault zones, fracture traces, facies changes, solution channels, buried stream deposits, cross cutting structures and other geologic features that may affect the ability of the owner or operator to monitor the groundwater or predict the impact of the disposal facility on groundwater; and

(viii) recommendations for landfill siting and conceptual design for the department to review and approve.

(F) The results and conclusions of the phase II report shall be certified by a qualified groundwater scientist.

(c) Foundation and mass stability analysis.

(1) The material beneath the unit shall have sufficient strength to support the weight of the unit during all phases of construction and operation. The loads and loading rate shall not cause or contribute to the failure of the liner or leachate collection system.

(2) The total settlement or swell of the foundation shall not cause or contribute to the failure of the liner or leachate collection system.

(3) The solid waste disposal unit shall be designed to achieve a safety factor during the design period against bearing capacity failure of at least 2.0 under static conditions and 1.5 under seismic loadings.

(4) The waste disposal unit shall be designed to achieve a factor of safety against slope failure during the design period of at least 1.5 for static conditions and 1.3 under seismic conditions.

(5) The liner and leachate collection system shall be stable during all phases of construction and operation. The side slopes shall achieve a minimum static safety factor of 1.5 and a minimum seismic safety factor of 1.3 at all times.

(6) In calculating factors of safety, both long term, in tens or hundreds of years, and short term, over the design period of the facility, conditions expected at the facility shall be considered.

(7) The potential for earthquake or blast-induced liquefaction, and its effect on the stability and integrity of the unit shall be considered and taken into account in the design. The potential for landslides or earthquake-induced liquefaction outside the unit shall be considered if such events could affect the unit.

(d) Foundation construction.

(1) If the *in situ* material provides insufficient strength to meet the requirements of subsection (c), then the insufficient material shall be removed and replaced with clean materials sufficient to meet the requirements of subsection (c).

(2) All trees, stumps, roots, boulders and debris shall be removed.

(3) All material shall be compacted to achieve the strength and density properties necessary to demonstrate compliance with this part.

(4) Placement of frozen soil or soil onto frozen ground shall be prohibited.

(5) The foundation shall be constructed and graded to provide a smooth, workable surface on which to construct the liner.

(e) Liner standards.

(1) New MSWLF units shall be constructed:

(A) with a composite liner and a leachate collection system that is designed and constructed in accordance with subsections (g), (h), and (i). For purposes of this regulation, "composite liner" means a system consisting of two components. The upper component shall consist of a minimum 30-mil geomembrane, the lower component shall consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. Geomembrane components consisting of high density

polyethylene (HDPE) shall be at least 60-mil thick. The geomembrane component shall be installed in direct and uniform contact with the compacted soil component in order to minimize the migration of leachate through the geomembrane should a break occur; or

(B) in accordance with an alternative design approved by the department. The design shall demonstrate that the concentration values listed in table 1 below will not be exceeded in the uppermost aquifer at the point of compliance. The point of compliance shall be within 150 meters (492 feet) of the edge of the planned unit boundary. In addition, the point of compliance shall be on the owner's or operator's property and shall be at least 15.24 meters (50 feet) from the property boundary.

(2) When approving a design that complies with paragraph (1)(B), the department shall consider at least the following factors:

(A) the hydrogeologic characteristics of the facility and surrounding land;

(B) the climatic factors of the area; and

(C) the volume and physical and chemical characteristics of the leachate. The design's performance shall be evaluated at maximum annual leachate flow conditions.

(3) Approval of alternate designs shall be considered by the department only when:

(A) the technology or material has been successfully utilized in at least one application similar to the proposed application; and

(B) methods for ensuring quality control during the manufacture and construction of the liner can be implemented.

(4) The owner or operator shall document in the operating record that the liner meets the liner standards in K.A.R. 28-29-104(e)(1)(A) or (B).

TABLE 1—MAXIMUM CONTAMINANT LEVELS

Chemical	MCL (mg/l)
Arsenic	0.05
Barium	1.0
Benzene	0.005
Cadmium	0.005

Carbon tetrachloride	0.005
Chromium (hexavalent)	0.1
2,4-Dichlorophenoxy acetic acid	0.1
1,4-Dichlorobenzene	0.075
1,2-Dichlorobenzene	0.6
1,2-Dichloroethane	0.005
1,1-Dichloroethylene	0.007
cis-1,2-Dichloroethylene	0.07
trans-1,2-Dichloroethylene	0.1
1,2 Dichloropropane	0.005
Endrin	0.0002
Ethylbenzene	0.7
Fluoride	4
Lindane	0.004
Lead	0.05
Mercury	0.002
Methoxychlor	0.1
Monochlorbenzene	0.1
Nitrate	10
Nitrite	1.0
Total Nitrate/Nitrite	10
Selenium	0.05
Silver	0.05
Styrene	0.1

Tetrachloroethylene	0.005
Toluene	1
Toxaphene	0.005
1,1,1-Trichloromethane	0.2
Trichloroethylene	0.005
2,4,5-Trichlorophenoxy acetic acid	0.01
Vinyl Chloride	0.002
Xylenes	10

(f) Liner construction.

(1) The construction and compaction of the liner shall be carried out in accordance with the approved design to reduce void spaces and allow the liner to support the loadings imposed by the waste disposal operation without settling that causes or contributes to the failure of the leachate collection system.

(2) The liner shall be constructed from materials whose properties are not affected by contact with the constituents expected to be in leachate generated by the landfill.

(3) Geomembrane liners shall be constructed in compliance with the following requirements.

(A) The geomembrane shall be supported by a compacted base free from sharp objects. The geomembrane shall be chemically compatible with the supporting soil materials.

(B) The geomembrane shall have sufficient strength and durability to function at the site for the design period under the maximum expected loadings imposed by the waste and equipment and stresses imposed by settlement, temperature, construction and operation.

(C) Seams shall be made in the field according to the manufacturer's specifications. All sections shall be arranged so that the use of field seams is minimized and seams are oriented in the direction subject to the least amount of stress where practical.

(D) The leachate collection system shall be designed to avoid loss of leachate through openings through the geomembrane.

(g) Leachate drainage system.

(1) The leachate drainage system shall be designed and constructed to operate for the entire design period.

(2) The system shall be designed in conjunction with the leachate collection system required by subsection (h):

(A) to maintain a maximum head of leachate 0.30 meter (one foot) above the liner; and

(B) to operate during the month when the highest average monthly precipitation occurs, and if the liner bottom is located within the saturated zone, under the condition that the groundwater table is at its seasonal high level.

(3) A drainage layer shall overlay the entire liner system. This drainage layer shall be no less than 0.30 meter (one foot) thick.

(4) The drainage layer shall be designed to maintain flow throughout the drainage layer under the conditions described in paragraph (g)(2) above.

(5) Materials used in the leachate drainage system shall be chemically resistant to the wastes and the leachate expected to be produced.

(h) Leachate collection system.

(1) The leachate collection system shall be designed and constructed to function for the entire design period. The leachate collection system shall consist of conduits including pipes, trenches, or a combination of pipes and trenches.

(2) Materials used in the leachate collection system shall be chemically resistant to the leachate expected to be produced.

(3) The leachate collection system shall be designed so that leachate drains freely from the collection conduits. If sumps are used, leachate shall be removed via gravity flow, whenever possible, before the level of leachate in the sumps rises above the invert of the collection conduits under the conditions established in paragraph (g)(2) above. If gravity flow is not possible, pumping may be utilized to remove leachate, but the use of pumps shall be minimized.

(4) Collection conduits shall be designed to capture leachate for open channel flow to convey leachate under the conditions established in paragraph (g)(2) above.

(5) Collection pipe conduits.

(A) Collection pipe shall be of a cross-sectional area that allows cleaning and at least 0.10 meter (four inches) nominal inside diameter.
(B) The collection pipe material and bedding materials as placed shall possess structural strength to support the maximum loads imposed by the overlying materials and equipment used at the facility, as well as the effects of differential settling.
(C) Collection pipes shall be constructed within a coarse gravel envelope using a graded filter or geotextile as necessary to minimize clogging.
(D) The collection pipe system shall be equipped with a sufficient number of manholes and cleanout risers to allow cleaning and maintenance of all pipes throughout the design period.
(6) Trench conduits.
(A) Trench conduits shall be designed to minimize particulate and biological clogging.
(B) Trench conduits shall be constructed to minimize movement of drainage media when a load is placed on the media.
(i) Leachate treatment and disposal system.
(1) The owner or operator shall be responsible for the operation of a leachate management system designed to handle all leachate as it is removed from the collection system. The leachate management system shall consist of any combination of storage, treatment, pretreatment, and disposal options.
(2) The leachate management system shall allow for the management and disposal of leachate during routine maintenance and repairs.
(3) Standards for leachate storage systems.
(A) The leachate storage facility shall be capable of storing a minimum of five days' worth of accumulated leachate at the maximum generation rate used in designing the leachate drainage system in accordance with subsection (g) of this regulation.
(B) Each leachate storage facility shall be equipped with secondary containment systems equivalent to the protection provided by a clay liner 0.61 meter (two feet) thick, having a permeability no greater than 1×10^{-7} centimeters per second.
(C) Each leachate storage system shall be fabricated from material compatible with the leachate expected to be generated and resistant to temperature extremes.
(D) The leachate storage system shall be designed to minimize odors.

(E) The leachate drainage and collection system shall not be used for the purpose of storing leachate.

(4) Standards for discharge to an off-site treatment works.

(A) Each owner or operator that discharges leachate to off-site facilities shall ensure that the receiving facility has all applicable permits or approvals in accordance with state and local water regulations.

(B) The owner or operator of a MSWLF may be required to obtain a permit or prior approval for conveyance to an off-site treatment facility.

(C) Pumps, meters, valves and monitoring stations that control and monitor the flow of leachate from the unit and which are under the control of the owner or operator shall be considered part of the facility and shall be accessible to the owner or operator at all times.

(5) Standards for leachate recycling systems.

(A) A leachate recycling system shall be utilized only at permitted waste disposal units that meet the following requirements.

(i) The unit shall have a liner designed, constructed and maintained to meet the minimum standards of paragraph (e)(1)(A) or (B) of this regulation.

(ii) The unit shall have a leachate collection system in place and operating in accordance with subsection (h) of this regulation.

(iii) The topography shall be such that any accidental leachate run-off can be controlled by ditches, berms or other equivalent control means.

(B) Leachate shall not be recycled during precipitation events or in volumes large enough to cause run-off or surface seeps.

(C) The amount of leachate added to the unit shall not exceed the ability of the waste and cover soils to transmit leachate flow downward. All other leachate shall be considered excess leachate, and a leachate management system capable of disposing of all excess leachate shall be available.

(D) The leachate storage and distribution system shall be designed to avoid exposure of leachate to air unless aeration or functionally equivalent devices are utilized.

(E) The distribution system shall be designed to allow leachate to be evenly distributed beneath the surface over the recycle area.

(6) Leachate monitoring.

(A) Representative samples of leachate shall be collected annually from each unit and tested in accordance with paragraph (i)(6)(B) of this regulation at a frequency of once per year while the leachate management system is in operation.

(B) Discharges of leachate from MSWLFs shall be tested for the following constituents prior to treatment or pretreatment:

(i) five-day biochemical oxygen demand (BOD_5);

(ii) total suspended solids;

(iii) total iron;

(iv) pH;

(v) each of the appendix I parameters listed in K.A.R. 28-29-113; and

(vi) any other constituents as specified by the director.

(C) If it can be shown that the removed constituents are not reasonably expected to be contained in or derived from the waste contained in the unit, the list of constituents in (i)(6)(B) of this regulation may be modified by the director.

(D) An appropriate alternative frequency for repeated sampling and analysis for the constituents listed in paragraph (i)(6)(B) of this regulation, or the alternative list approved in accordance with paragraph (i)(6)(C) of this regulation, may be specified by the director during the active life, including closure, and the post-closure care period. The alternative frequency shall be based on consideration of the following factors:

(i) leachate quantity; and

(ii) long-term trends in leachate quality.

(7) The owner or operator shall collect and dispose of leachate for a minimum of five years after closure and thereafter until it is determined by the director that treatment is no longer necessary.

(Authorized by K.S.A. 1993 Supp. 65-3406; implementing K.S.A. 65-3401; effective Oct. 24, 1994.)

***** Authenticated Kansas Administrative Regulation *****