

401 KAR 48:206. Petroleum-contaminated soil treatment facility liner soil layer quality assurance and quality control.

RELATES TO: KRS 224.01, 224.10, 224.40, 224.43, 224.99, 322.010(16), 322.180(16)
STATUTORY AUTHORITY: KRS 224.10-100, 224.40-100(9)(c), (24), (28), 224.40-305
CERTIFICATION STATEMENT:

NECESSITY, FUNCTION, AND CONFORMITY: KRS 224.40-100(19)(c), (24) and (28) requires the cabinet to promulgate rules and administrative regulations for the permitting, management, processing, or disposal of wastes. KRS 224.40-305 requires that persons engaging in the management, processing, and disposal of waste obtain a permit. This administrative regulation establishes the liner quality assurance and quality control testing requirements for petroleum-contaminated soil treatment facilities.

Section 1. Definitions.

- (1) "Certifying engineer" means "professional engineer," as defined by KRS 322.010(3), who implements the petroleum-contaminated soil treatment facility construction quality assurance plan
- (2) "Petroleum-contaminated soil" means silt, sand, clay, gravel, or other earthen material; or asphalt, concrete, or absorbent materials containing hydrocarbon concentrations above the levels established in 401 KAR 48:205, Section 6, Table 3, but does not exhibit a hazardous characteristic or is not a listed hazardous waste as defined in 401 KAR Chapter 31.
- (3) "Petroleum-contaminated soil treatment facility" means a solid waste site or facility where petroleum-contaminated soil is treated to reduce contaminant concentrations to or below the levels established in 401 KAR 48:205, Section 6, Table 3.
- (4) "Quality assurance" means the procedures implemented by the professional engineer to ensure that the construction of the petroleum-contaminated soil treatment facility meets design specifications and performance requirements.
- (5) "Quality control" means the system of control implemented by the manufacturer, fabricator, installer, construction contractor, operator, or other person in order to meet construction specifications for the construction of the petroleum-contaminated soil treatment facility.

Section 2. Applicability.

- (1) The quality assurance and quality control requirements of this administrative regulation apply to the construction of biopile liners at petroleum-contaminated soil treatment facilities.
- (2) The liner design requirements for biopiles at petroleum-contaminated soil treatment facilities are established in 401 KAR 48:205, Section 3.

Section 3. Specific Subgrade Requirement for Bottom Liners.

- (1) The petroleum-contaminated soil treatment facility liner subgrade is the uppermost in situ rock layer, in situ soil layer, or structural soil fill that shall be graded and prepared for liner construction.
- (2) Materials required. The liner subgrade material shall be free of organic material and consist of bedrock, on-site soils, or structural soil fill with the ability to support the maximum load with a minimum factor of safety of two and zero-tenths (2.0).
- (3) Construction requirements.
 - (a) The subgrade shall be graded in accordance with the requirements of the approved engineering plans, report, and specifications in the petroleum-contaminated soil treatment facility permit.
 - (b) The material shall be sufficiently dry and structurally sound to ensure that the first lift and all succeeding lifts of structural soil fill placed over the subgrade shall be

adequately compacted to comply with the design requirements.

(4) Certification requirements.

(a) The certifying engineer shall include in the form DEP 8064, Construction Progress Report for a Petroleum-contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10, a discussion of the reviewed data resulting from the quality assurance and quality control testing required in this section of this administrative regulation.

(b) The results of all testing shall be included in the form DEP 8064, Construction Progress Report for a Petroleum-contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10, including documentation of failed test results, descriptions of the procedures used to repair the failed material, and documentation of retesting performed.

(c) At a minimum, the subgrade shall be inspected in accordance with the following requirements:

1. Before placing material over the subgrade, the certifying engineer shall visually inspect the exposed surface to evaluate the suitability of the subgrade and ensure that the surface is properly compacted, smooth, uniform, and has positive surface drainage;

2. Liner soil subgrade shall be proof-rolled using a fully loaded articulated truck with a fifty-five (55) ton gross vehicle weight;

3. A structural soil fill subgrade shall be tested for density and moisture content at a minimum frequency of nine (9) tests per acre, and constructed in lifts;

4. The subgrade shall be compacted to a density of at least ninety-two (92) percent of the standard proctor;

5. The completed form DEP 8064, Construction Progress Report for a Petroleum Contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10, shall show the finished elevation of the completed subgrade, referenced to existing site control, using a Three (3) Dimensional Terrain Model on Computer Assisted Design Drawing (CADD) or cross-section;

6. The finished elevations shall serve as documentation and reference data for future volume calculations; and

7. Testing shall be performed in accordance with ASTM International standards, or similar method based on the applicable standards of practice for certification by a professional engineer as established in KRS 322.010(16).

Section 4. Specific Soil Support Component Requirements of Compacted Clay Liner (CCL) Systems for Bottom Liners. The Compacted Clay Liner (CCL) component of the bottom liner shall be a continuous layer of low permeability soil constructed to control fluid migration.

(1)

(a) Low permeability soil components shall have a maximum remolded coefficient of permeability of 1×10^{-7} centimeters per second.

(b) The soil shall be placed without damaging the collection and removal system components.

(c) The soil material in the top maximum compacted six (6) inch lift shall be free of roots, wood, or other decayable materials and durable rock greater than one-half (1/2) inches in diameter.

(d) The soil material in the bottom lifts shall be free of roots, wood, or other decayable materials and durable rock greater than two (2) inches in diameter.

(e) The CCL shall contain not more than thirty (30) percent by volume durable rock.

(f) The soil shall be compacted to a minimum of ninety-two (92) percent of the modified or standard proctor density.

(2) Construction requirements. The certifying engineer shall ensure that the soil component of the liner system installation conforms to the following minimum requirements:

(a)

1. Compaction shall be performed by properly controlling the moisture content, lift thickness, and other necessary details to obtain the density, moisture, and permeability characteristics established in this administrative regulation; and
2. The maximum final compacted thickness of each lift of soil material shall be six (6) inches or the thickness necessary to protect the integrity of underlying components and achieve the required liner performance standards;

(b) During construction, the moisture content of the CCL shall be maintained within the range identified in accordance with paragraph (c) of this section to ensure that each remolded lift attains the required minimum permeability;

(c)

1. The layers of the CCL shall be compacted using non-vibratory compactors with full depth penetrating feet with a minimum of six (6) passes per soil layer.
2.
 - a. The compactor ballast shall be adjusted to prevent reaching the desired proctor density with fewer than six (6) passes; and
 - b. The sheepfoot length shall be one (1) inch longer than the loose soil layer thickness; and

(d) At the end of each work period, the surface shall be sealed from rain infiltration.

(3) Certification requirements. The certifying engineer shall include in the form DEP 8064, Construction Progress Report for a Petroleum Contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 11:

(a) A discussion of required quality assurance and quality control testing. Quality assurance testing shall include moisture-density testing performed using nuclear methods:

1. At least nine (9) density tests per acre per lift of soil material placed; and
2. A minimum of nine (9) moisture content tests per lift of soil material placed; and

(b) The results of testing, including documentation of failed test results, descriptions of the procedures used to correct the improperly installed material, and statements of retesting performed in accordance with the following requirements:

1.

- a. The certifying engineer shall certify, after review of the quality control testing of the soil layer, that the material meets the requirements of the approved engineering plans, reports, and specifications in the petroleum-contaminated soil treatment facility permit.
- b. The certifying engineer shall approve and certify the quality assurance testing of all soil liner materials.
- c. All quality assurance testing shall be done by the certifying engineer or under the direct supervision of the certifying engineer as established in KRS 322.180(16).

2. The following quality control tests shall be performed on a minimum of at least one (1) sample from each soil classification:

- a. One (1) analysis of soil particle size for every 2,000 cubic yards of soil material;
- b. Classification of soils for engineering purposes for each 10,000 cubic yards of soil material;
- c. One (1) moisture content test for every 2,000 cubic yards of soil material;
- d. One (1) Atterberg limits analysis of plastic and liquid limit and plasticity index in the permit for every 2,000 cubic yards of soil material; and

- e.
 - (i) A minimum of one (1) comparison of the moisture-density-permeability relation for every 20,000 cubic yards of soil material; and
 - (ii) Procedures that comply with the American Society of Civil Engineers paper, "Water Content-Density Criteria for Compacted Soil Liners" by Daniel and Benson, to develop the window of overall acceptable zone of permeability on a graph of dry unit weight versus molding water content; and
- (c) All testing shall be performed in accordance with a method based on the applicable standards of practice for certification by a professional engineer as established in KRS 322.010(16).

Section 5. Specific Requirements for the Geosynthetic Clay Liner (GCL) Support Layer for Bottom Liners. The GCL support layer of the bottom liner shall be a continuous layer of cohesive soil constructed to adequately support or protect the geosynthetic clay liner (GCL) and resist puncturing.

- (1)
 - (a) The GCL support layer of the bottom liner system shall have a maximum remolded coefficient of permeability of 1×10^{-7} centimeters per second in the laboratory.
 - (b) The soil shall be placed without damaging the collection and removal system components.
 - (c) The soil material in the top six (6) inch lift shall be free of roots, wood, or other decayable materials and durable rock greater than one (1) inch in diameter.
 - (d) The soil material in the bottom lifts shall be free of roots, wood or other decayable materials and durable rock greater than two (2) inches in diameter.
 - (e) The CCL shall contain not more than thirty (30) percent by volume durable rock.
 - (f) The soil shall be compacted to a minimum of ninety-five (95) percent of the standard proctor density.
- (2) Construction requirements. The certifying engineer shall ensure that the support component of the bottom liner system installation conforms to the following minimum requirements:
 - (a)
 - 1. Compaction shall be performed by controlling the moisture content and lift thickness to obtain the density and moisture window derived using procedures in Water Content-Density Criteria for Compacted Soil Liners;
 - 2. The maximum final compacted thickness of each lift of soil material shall be six (6) inches; and
 - 3. The thickness of the initial lift shall be increased as necessary to protect the integrity of underlying components and achieve the required liner performance standards;
 - (b) To ensure that each lift attains the required density during construction of the support layer, the moisture content of the GCL support component of the bottom liner system shall be maintained within the range identified in accordance with the ASTM D698 - 07e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)); and
 - (c) At the end of each work period, the surface shall be sealed from rain infiltration.
- (3) Certification requirements. The certifying engineer shall include in the form DEP 8064, Construction Progress Report for a Petroleum Contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10:
 - (a) A discussion of required quality assurance and quality control testing. Quality assurance testing shall include:
 - 1. At least nine (9) density tests per acre per lift of soil material placed; and

2. A minimum of nine (9) moisture content tests per acre per lift of soil material placed; and
- (b) The results of all testing shall be included in the form DEP 8064, Construction Progress Report for a Petroleum Contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10, including documentation of failed test results, descriptions of the procedures used to correct the improperly installed material, and statements of retesting performed in accordance with the following requirements:
 1.
 - a. The certifying engineer shall certify, after review of the quality control testing of the GCL support layer, if the material meets the requirements of the approved engineering plans, reports, and specifications in the petroleum-contaminated soil treatment facility permit; and
 - b. The quality control testing shall ensure that the specified material meets the density requirements of subsection (1) of this section; and
 2. Quality assurance testing shall be based on the applicable standards of practice for certification by a professional engineer as established in KRS 322.010(16), and shall be performed at the following minimum frequency for each soil classification:
 - a. One (1) analysis of soil particle size for every 4,000 cubic yards of soil material;
 - b. One (1) analysis of soil classification for engineering purposes for each 20,000 cubic yards of soil material;
 - c. One (1) moisture content test for every 4,000 cubic yards of soil material;
 - d. One (1) Atterberg limits analysis of plastic and liquid limit and plasticity index in the permit for every 4,000 cubic yards of soil material placed; and
 - e. One (1) moisture content test for every 4,000 cubic yards of soil material placed.

Section 6. Specific Requirements for the Synthetic Liner Soil Support Layer for Bottom Liners. The synthetic liner soil support layer of the bottom liner system shall be a continuous layer of soil constructed to adequately support or protect the synthetic liner.

(1)

- (a) The synthetic liner support layer of the bottom liner system shall be placed without damaging the collection and removal system components.
- (b) The soil material in the top six (6) inch lift shall be free of roots, wood, or other decayable materials, and durable rock greater than one (1) inch in diameter.
- (c) The soil material in the bottom lifts shall be free of roots, wood, or other decayable materials and durable rock greater than two (2) inches in diameter.
- (d) The synthetic liner support layer shall not contain more than thirty (30) percent by volume durable rock.
- (e) The soils shall be compacted to a minimum of ninety-two (92) percent of the standard proctor density.

(2) Construction requirements. The certifying engineer shall ensure that the synthetic liner support component of the bottom liner system installation conforms to the following minimum requirements:

(a)

1. Compaction shall be performed by properly controlling the moisture content and lift thickness to obtain the density and moisture characteristics established within the range identified in accordance with the ASTM D698 - 07e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³);
2. The maximum final compacted thickness of each lift of soil material shall be six (6) inches. The thickness of the initial lift shall be increased as necessary to protect

the integrity of underlying components and achieve the required liner performance standards;

(b) To ensure that each lift attains the required density during construction of the synthetic liner support layer, the moisture content of the synthetic liner support component of the bottom liner system shall be maintained within the range identified in accordance with the ASTM D698 - 07e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³); and

(c) At the end of each work period, the surface shall be sealed from rain infiltration.

(3) Certification requirements. The certifying engineer shall include in the form DEP 8064, Construction Progress Report for a Petroleum Contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10:

(a) A discussion of required quality assurance and quality control testing. Quality assurance testing shall include:

1. At least nine (9) density tests per acre per lift of soil material; and

2. A minimum of nine (9) moisture content tests per acre per lift of soil material; and

(b) The results of testing, including documentation of failed test results, descriptions of the procedures used to correct the improperly installed material, and statements of retesting performed in accordance with the following requirements:

1.

a. The certifying engineer shall certify, after review of the quality control testing of the synthetic liner support layer, if the material meets the requirements of the approved engineering plans, reports, and specifications in the permit; and

b. The quality control testing shall ensure that the specified material meets the density requirements of subsection (1) of this section; and

2. Quality assurance testing shall be based on the applicable standards of practice for certification by a professional engineer as established in KRS 322.010(16), and shall be performed at the following minimum frequency for each soil classification:

a. One (1) analysis of soil particle size for every 4,000 cubic yards of soil material;

b. One (1) analysis of soil classification for engineering purposes for each 20,000 cubic yards of soil material; and

c. One (1) moisture content test for every 4,000 cubic yards of soil material placed.

Section 7. Incorporation by Reference.

(1) The following material is incorporated by reference:

(a) "Water Content-Density Criteria for Compacted Soil Liners" by David E. Daniel, Member, American Society of Civil Engineers (ASCE), and Craig H. Benson, Associate Member, ASCE, The Journal of Geotechnical Engineering, Vol. 116, No. 12, December 1990; and

(b) ASTM D698 - 07e1 "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)", April 2007.

(2) This material may be inspected, copied, or obtained, subject to applicable copyright law, at the Division of Waste Management, 300 Sower Boulevard, Frankfort, Kentucky 40601, Monday through Friday, 8 a.m. to 4:30 p.m., or from the Web site at eec.ky.gov/environmental-protection/waste.

(3) This material may also be obtained at the American Society of Civil Engineers:

(a) ASCE World Headquarters, 1801 Alexander Bell Drive, Reston, Virginia 20191-4400 USA; and

(b) Web site: <http://www.asce.org/asce.cfm>

(401 KAR 048:206. 37 Ky.R. 2788; 38 Ky.R. 559; eff. 10-6-2011; TAm eff. 7-8-2016; Crt eff. 8-13-2018; TAm eff. 5-7-2019; Crt eff. 7-22-2025.)