3745-30-07 **Residual waste landfill facility construction.**

The permittee shall contact the health department (if on the approved list as specified in rule 3745-37-08 of the Administrative Code) and Ohio EPA prior to commencing construction of each phase of the residual waste landfill facility for the purpose of inspection.

(A) The permittee shall not accept residual waste in any phase of the residual waste landfill facility until construction of that phase has been certified in accordance with paragraph (B) of this rule, inspected by the health commissioner (if on the approved list as specified in rule 3745-37-08 of the Administrative Code) and by the director or their authorized representatives, and written concurrence has been received from the director or his authorized representative that construction is in compliance with the permit to install and the approved permit to install application.

(B) Upon installation of the items in paragraph (H)(2) of this rule in each phase of the residual waste landfill facility, a certification report, prepared by a professional skilled in the appropriate discipline(s), shall be submitted to the Ohio EPA and to the health department (if on the approved list as specified in rule 3745-37-08 of the Administrative Code). The certification report shall include the following:

(1) Results of all testing required by this rule or required by the approved permit to install.

(2) Any deviations from the permit to install or the approved permit to install application.

(3) Record drawings showing the following:

(a) Plan views with test locations.

(b) Cross sections.

(c) Necessary details.

(4) A notarized statement that, to the best of the knowledge of the permittee, the certification report is true, accurate, and contains all information required by paragraph (B) of this rule.

The initial certification report shall also contain copies of permits in fulfillment of requirements in paragraph ~~(K)~~(E)(7)(a) of rule 3745-30-14 of the Administrative Code.

(C) The following specifications in design and construction of the residual waste landfill facility shall be used whenever the features in this paragraph are required by paragraph ~~(E)~~(C) of rule 3745-30-06 of the Administrative Code.

(1) A recompacted soil liner, at a minimum, shall comply with the following:

(a) Be constructed using loose lifts eight inches thick or less to achieve uniform compaction. Each lift shall have a maximum permeability of 1 x 10^{-7} cm/sec.

(b) Be constructed of a soil with a maximum clod size of three inches or half the lift thickness, whichever is less.

(c) Be constructed of a soil as follows:

(i) With one hundred per cent of the particles having a maximum dimension not greater than two inches.

(ii) With not more than ten per cent of the particles, by weight, having a dimension greater than 0.75 inches.

(iii) With not less than fifty per cent of the particles, by weight, passing through the 200-mesh sieve.

(iv) With not less than twenty-five per cent of the particles, by weight, having a maximum dimension not greater than 0.002 millimeters.

(d) Be compacted to at least ninety-five per cent of the maximum "standard proctor density" using ASTM D698-00A or at least ninety per cent of the maximum "modified proctor density" using ASTM D1557-00.

(e) Be compacted at a moisture content at or wet of optimum.

(f) Not be comprised of solid waste.

(g) Be constructed using the number of passes and lift thickness, and the same or similar type and weight of compaction equipment established by testing required in paragraph (F) of this rule.

(h) Be placed on the bottom and exterior excavated sides of the landfill and

have a minimum bottom slope of two per cent and a maximum slope based on the following:

(i) Compaction equipment limitations.

(ii) Slope stability.

(iii) Maximum friction angle between any soil-geosynthetic interface and between any geosynthetic-geosynthetic interface.

(iv) Resistance of geosynthetic and geosynthetic seams to tensile forces.

(i) Be constructed on a prepared surface that shall comply with the following:

(i) Be free of debris, foreign material, and deleterious material.

(ii) Be able to bear the weight of the landfill and its construction and operations without causing or allowing a failure of the liner to occur through settling.

(iii) Not have any abrupt changes in grade that may result in damage to geosynthetics.

(j) Be designed and constructed to comply with the following:

(i) Be at least one and one half feet thick for a class III residual waste landfill or at least three feet thick if no flexible membrane liner is proposed in accordance with paragraph (C)(2) of this rule.

(ii) Be at least three feet thick for a class II residual waste landfill. The director may approve an alternative thickness to be no less than one and one half feet, based on the result of the calculations outlined in appendix ~~I~~A ~~of~~to this rule.

(iii) Be at least five feet thick for class I residual waste landfill. The director may approve an alternate thickness, to be no less than three feet, based on the result of the calculations outlined in appendix ~~I~~A ~~of~~to this rule.

To allow for alternate technologies, the director may approve an alternate thickness based on a design that is no less protective of

human health and the environment.

(k) Have a factor of safety for hydrostatic uplift not less than 1.4.

(l) Be adequately protected from damage due to desiccation, freeze/thaw cycles, wet/dry cycles, and the intrusion of objects during construction and operation.

Alternatives for paragraphs (C)(1)(a) to (C)(1)(e) of this rule may be used if it is demonstrated to the satisfaction of the director or his authorized representative that the materials and techniques will result in each lift having a maximum permeability of 1×10^{-7} cm/sec.

(2) A flexible membrane liner, placed on the recompacted soil liner, shall comply with the following:

(a) Be negligibly permeable to fluid migration.

(b) Be physically and chemically resistant to chemical attack by the residual waste, leachate, or other materials which may come in contact with the flexible membrane liner.

(c) Be seamed to allow no more than negligible amounts of leakage; the seaming material shall be physically and chemically resistant to chemical attack by the residual waste, leachate, or other materials that may come in contact with the seams.

(d) Have properties for its installation and use which are acceptable to the director.

(e) Be protected from the drainage layer by a cushion layer as required by the director.

A flexible membrane liner is not required for a class III residual waste landfill which incorporates a recompacted soil liner at least three feet thick in accordance with paragraph (C)(1)(j)(i) of this rule.

To allow for alternate technologies, the director may approve a design which does not incorporate a flexible membrane liner if the design will be no less protective of human health and the environment.

(3) A leachate management system shall be designed to do the following:

(a) To contain and collect leachate within the boundary of the residual waste landfill flexible membrane liner and/or soil liner.

(b) To limit the level of leachate in areas other than lift stations to a maximum of one foot. Any granular material used as a drainage medium shall have a permeability no less than 1×10^{-3} cm/sec.

(c) To function without clogging. A filter layer may be required by the director.

(d) To prevent crushing of or damage to, any of its components. A protective layer, to protect the leachate management system and the residual waste landfill liner components from the intrusion of objects during construction and operation, which may consist of select residual waste, may be required by the director.

(e) To be chemically resistant to attack by the residual waste, leachate, or any other material it may contact.

(f) To convey and store leachate outside the limits of solid waste placement, such that:

(i) Any leachate conveyance or storage structures located outside the limits of solid waste placement shall be no less protective of the environment than the residual waste landfill, as determined by the director.

(ii) Be monitored if required by the director.

(iii) For storage tanks, be provided with spill containment.

(iv) For leachate pipelines, be double-cased.

(v) For storage structures, have a minimum of one week of storage capacity, calculated using design assumptions which simulate a final cap system completed in accordance with rule 3745-30-09 of the Administrative Code.

(g) To treat and dispose of leachate in accordance with one of the following:

(i) Leachate is either treated and disposed on site at the residual waste landfill facility.

(ii) Leachate is pretreated on-site and transported or piped off-site for final treatment and disposal.

(iii) Leachate is transported or piped off-site for treatment and disposal.

A contingency plan for the treatment and disposal of leachate shall be developed describing the immediate and long-term steps, to include the identification of available back-up treatment facilities, if applicable, and for new residual waste landfill facilities which propose off-site treatment, to include the identification of on-site land for the construction and operation of an on-site treatment facility in the event that leachate cannot be treated and disposed in accordance with the option proposed in the permit to install application.

If, at any time, leachate is evaluated to be hazardous in accordance with rule 3745-52-11 of the Administrative Code, it shall be managed in accordance with Chapters 3745-50 to 3745-69 of the Administrative Code, and the generator standards for storage shall apply in accordance with Chapter 3745-52 of the Administrative Code.

(4) Surface water control structures.

(a) Any permanent surface water control structures shall be designed to accommodate, by non-mechanical means, the peak flow from the twenty-five-year/twenty-four-hour storm event.

(b) Any temporary surface water control structures shall be designed to accommodate the peak flow from the twenty-five-year/twenty-four-hour storm event.

(c) Surface water control structures shall be designed to minimize silting and scouring.

(d) Any sedimentation ponds shall be designed and constructed in accordance with the following:

(i) Minimum storage volume shall be provided based on either the

calculated runoff volume from a ten-year/twenty-four-hour storm event, or 0.125 acre-feet per year, for each acre of disturbed area within the upstream drainage area, multiplied by the scheduled frequency of pond clean-out (in years), whichever is greater.

(ii) The principal spillway shall safely discharge the flow from a ten-year/twenty-four-hour storm event. The inlet elevation of the emergency spillway shall be designed to provide flood storage, with no flow entering the emergency spillway, for a twenty-five-year/twenty-four-hour storm event, with allowance provided for the flow passed by the principal spillway during the event.

(iii) The combination of principal and emergency spillways shall safely discharge the flow from a one-hundred-year/twenty-four-hour storm event. The embankment design shall provide for no less than one foot net freeboard when flow is at the design depth, after allowance for embankment settlement.

(iv) The sedimentation pond shall be constructed using a recompacted soil liner, a flexible membrane liner, or a combination thereof, based on a design acceptable to the director.

(5) For survey marks: for survey marks: at least three permanent survey marks, with each located on separate sides of the proposed sanitary landfill facility, shall be established prior to any construction and within easy access to the limits of solid waste placement in accordance with the following:

(a) Survey marks shall be referenced horizontally to the 1927 North American Datum, 1983 North American Datum, or State Plane Coordinate System and vertically to the 1929 or 1988 North American Vertical Sea Level Datum as identified on the 7.5 minute series quadrangle sheets published by the United States geological survey.

(b) Survey marks shall be at least as stable as a poured concrete monument ten inches in diameter installed to a depth of forty-two inches below the ground surface. Each constructed survey mark shall include a corrosion resistant metallic disk which indicates horizontal and vertical coordinates of the survey mark and shall contain a magnet or ferromagnetic rod to allow identification through magnetic detection methods.

(c) Survey control standards for the survey marks shall be in accordance with

the following:

(i) For the first facility survey mark established from the known control point, minimum horizontal distance accuracy shall be one foot horizontal to two thousand five hundred feet horizontal.

(ii) For each facility survey mark established from the first facility survey mark, minimum horizontal accuracy shall be one foot horizontal distance to five thousand feet horizontal.

(iii) For the first facility survey mark established from the known control point and for each facility survey mark established from the first facility survey mark, minimum vertical accuracy shall be one inch to five thousand feet horizontal.

(6) Grades of access roads shall not exceed twelve per cent. All access roads shall be designed to allow passage of loaded vehicles during all weather conditions with minimum erosion and dust generation and with adequate drainage.

(7) Any permanent ground water control structures shall adequately control ground water infiltration through the use of non-mechanical means such as impermeable barriers or permeable drainage structures. However, no permanent ground water control structures may be used to dewater an aquifer system, unless the aquifer system exists only under the property owned or leased by the permittee of the residual waste landfill facility, or it can be demonstrated to the satisfaction of the director that no adverse social or economic impact will occur.

(8) Any explosive gas monitoring systems shall be designed and constructed in accordance with paragraph (E) of rule 3745-27-12 of the Administrative Code.

(9) Any explosive gas control structures shall be designed so that explosive gas cannot travel laterally from the residual waste landfill facility or accumulate in occupied structures. Explosive gas control/extraction systems shall be designed in such a manner as to prevent fires within the limits of residual waste placement. Construction of the explosive gas control/extraction systems shall not compromise the integrity of the cap system, the leachate management system, or the recompacted soil liner.

(10) A residual waste landfill facility located within a geologically unstable area, other than in an area of potential subsidence resulting from underground

mining, shall be designed to resist the earth movement at the site. Geologically unstable areas include any of the following:

(a) Where on-site or local soil conditions result in significant differential settling.

(b) Where the downslope movement of soil or rock due to gravitational influence occurs.

(c) Where the lowering or collapse of the land surface occurs either locally or over broad regional areas.

(11) The design for the stability of all engineered components and the waste mass shall address any configuration throughout the applicable development and post closure periods. Potential failures associated with internal, interim and final slopes as these slopes are defined in rule 3745-30-05 of the Administrative Code, shall be used to define the minimum construction specifications and materials that, at a minimum, will meet the following:

(a) The factor of safety for hydrostatic uplift shall not be less than 1.40 at any location during the construction and operation of the facility.

(b) The factor of safety for bearing capacity of any vertical sump risers on the composite liner system shall not be less than 3.0.

(c) The factor of safety for static slope stability shall not be less than 1.50 using two dimensional limit equilibrium methods or another factor of safety using a method acceptable to the director when assessed for any of the following failure modes and conditions:

(i) Deep-seated translational and deep-seated rotational failure mechanisms of internal slopes, interim slopes, and final slopes for drained conditions and as applicable conditions representing the presence of excess pore water pressure at the onset of loading or unloading. For slopes containing geosynthetic interfaces placed at grades greater than 5.0 percent, residual shear strength conditions shall be used for any soil to geosynthetic or geosynthetic to geosynthetic interfaces.

[Comment: Ohio EPA considers any failure that occurs through a material or along an interface that is loaded with more than 1,440 pounds per square foot to be a deep seated failure mode.]

(ii) Shallow translational and shallow rotational failure mechanisms of internal slopes and final slopes for unsaturated conditions.

[Comment: Peak shear strengths can be used for most shallow failure modes.]

(d) The factor of safety for seismic slope stability shall not be less than 1.00 using two or three dimensional limit equilibrium methods, or another factor of safety using a method acceptable to the director when assessed for any of the following failure modes and conditions:

(i) Deep-seated translational and deep-seated rotational failure mechanisms of final slopes for drained conditions and as applicable conditions representing the presence of excess pore water pressure at the onset of loading or unloading. For slopes containing geosynthetic interfaces placed at grades greater than 5.0 percent, residual shear strength conditions shall be used for any soil to geosynthetic or geosynthetic to geosynthetic interfaces.

If required by the director, deep-seated translational and deep-seated rotational failure mechanisms of interim and internal slopes for drained conditions and as applicable conditions representing the presence of excess pore water pressure at the onset of loading or unloading. For slopes containing geosynthetic interfaces placed at grades greater than 5.0 percent, residual shear strength conditions shall be used for any soil to geosynthetic or geosynthetic to geosynthetic interfaces.

(ii) Shallow translational and shallow rotational failure mechanisms of final slopes for unsaturated conditions.

(e) The factor of safety against liquifaction shall not be less than 1.00 for internal slopes, interim slopes and final slopes.

(f) The factor of safety for static slope stability shall not be less than 1.10 using two dimensional limit equilibrium methods or other methods acceptable to the director when assessed for any of the following failure modes and conditions:

(i) If required by the director, shallow translational and shallow rotational failure mechanisms of internal slopes in which the

protective soils over the leachate collection layer have reached field capacity. Calculations shall use the maximum head predicted for the fifty year, one hour design storm.

(ii) Shallow translational and shallow rotational failure mechanisms of final slopes in which the cover soils over the drainage layer have reached field capacity. Calculations shall use the maximum head predicted for the one hundred year, one hour design storm.

[Comment: The number of digits after the decimal point indicates that rounding can only occur to establish the last digit. For example, 1.485 can be rounded to 1.49, but not 1.5 or 1.50.]

(12) Any oil wells and gas wells within the proposed limits of residual waste placement shall be properly plugged and abandoned in accordance with 1509. of the Revised Code.

(D) Prior to being used in construction of the recompacted soil liner required by paragraph (C) of this rule and the recompacted soil barrier layer required by paragraph (F)(3) of rule 3745-30-09 of the Administrative Code, and in any proposed drainage medium, the following characteristics of the earthen materials shall be determined to show that the material is suitable for use in construction of the residual waste landfill facility:

(1) For the soil material, all of the following:

(a) Recompacted permeability at construction specifications.

(b) Moisture content and density using an approved ASTM method.

(c) Grain size distribution using ASTM D422-63 for sieve and hydrometer methods.

(d) Atterberg limits using ASTM D4318-00.

Each of the above tests shall be performed on representative samples at least once for every one thousand five hundred cubic yards of soil, except the test outlined in paragraph (D)(1)(a) of this rule, which shall be performed at least once for every ten thousand cubic yards of soil.

(2) For any granular drainage material, to be tested at least once for every three thousand cubic yards of material for the following:

(a) Permeability.

(b) Grain size distribution using ASTM D422-63 for the sieve method.

(3) Chemical compatibility testing may be required by the director.

At the request of the health commissioner or the director, or their authorized representatives, results of testing required in this paragraph shall be made available for inspection.

(E) Prior to the installation of the geosynthetics, other synthetic materials, and joint sealing compounds used in the construction of the flexible membrane liner or any other component of the residual waste landfill, they shall comply with the following:

(1) Be shown to be physically and chemically resistant to attack by the residual waste, leachate, or other materials that they may come in contact with using USEPA method 9090 or other documented data.

(2) Be shown to have properties acceptable for installation and use.

(F) The following activities shall be performed to ensure that the appropriate components of the residual waste landfill facility are constructed to meet the specifications of this rule:

(1) The recompacted soil liner and the recompacted soil barrier layer in the cap system shall be modeled by the construction of test pads. Test pads shall comply with the following:

(a) Be designed such that the proposed tests are appropriate and their results are valid.

(b) Be constructed to establish the construction details, or verify or amend the construction details proposed in the approved permit, which are necessary to obtain sufficient compaction to satisfy the permeability requirement. The construction details include such items as the lift thickness, the water content necessary to achieve the desired compaction, and the type, weight, and number of passes of construction equipment.

(c) Be constructed prior to the construction of the residual waste landfill

component which the test pad will model.

(d) Be constructed whenever there is a significant change in soil material properties.

(e) Have a minimum width three times the width of compaction equipment, and a minimum length two times the length of compaction equipment, including power equipment and any attachments.

(f) Be comprised of at least four lifts.

(g) Be tested for field permeability, following the completion of test pad construction, using methods acceptable to the director. For each lift, a minimum of three tests for moisture content and density shall be performed.

(h) Be reconstructed as many times as necessary to meet the permeability requirement. Any amended construction details shall be noted for future soil liner or soil barrier layer construction.

An alternative to test pads may be used if it is demonstrated to the satisfaction of the director or his authorized representative that the alternative meets the requirements of this paragraph.

(2) If test pad results necessitate amended construction details, as outlined in paragraph (F)(1)(h) of this rule, the amended construction details shall replace the appropriate construction details from the approved permit to install. The residual waste landfill component that the test pad modeled shall be constructed using the amended construction details. These amendments shall be explicitly outlined in the construction certification report required by paragraph (B) of this rule.

(3) Moisture content and density testing of the recompacted soil liner and recompacted soil barrier in the cap system shall be performed at a frequency of no less than five tests per acre per lift.

(a) Any penetrations shall be repaired using methods acceptable to the director.

(b) For facilities disposing of residual wastes as identified in paragraph (B)(4) of rule 3745-30-01 of the Administrative Code, any significant differences between the results of the tests required by paragraph (F)(3)

of this rule and the results of similar tests performed on the approved test pad required by paragraph (F)(1) of this rule shall be justified by the permittee in the construction certification report required by paragraph (B) of this rule. In determining whether reconstruction of the recompacted soil liner or soil barrier layer in the cap system is necessary when a significant difference exists, the director shall consider the magnitude of the difference and the justification provided by the permittee. If a justification for different density test results involving the recompacted soil barrier layer in a cap system cites inferior compactability due to a residual waste subbase, the director shall consider what density values are practically attainable in compaction of soil on that subbase before requiring reconstruction of the soil barrier layer.

(4) Flexible membrane liners shall be tested, using methods acceptable to the director, as follows:

(a) For the purpose of testing every seaming apparatus in use each day, peel and shear tests shall be performed on scrap pieces of flexible membrane liner at the beginning of the seaming period and every four hours thereafter.

(b) Nondestructive testing shall be performed on one hundred per cent of the flexible membrane liner seams.

(c) Destructive testing for peel and shear shall be performed at least once for every five hundred feet of seam length. An alternate means may be used if it is demonstrated to the satisfaction of the director or his authorized representative that the alternate means meets the requirements of this paragraph.

(G) Failed tests. All quality assurance/quality control tests failing to meet the specifications outlined in this rule must be investigated. An area with a verified failure must be reconstructed to meet specifications. Reconstructed areas shall be retested at a frequency acceptable to the director.

(H) Quality assurance/quality control.

(1) A quality assurance/quality control plan for construction shall include the following:

(a) Sampling and testing procedures to be used in the field and in the

laboratory.

(b) Testing frequency.

(c) Parameters and sample locations.

(d) Procedures to be followed if a test fails.

(e) The management structure and the experience and training of the testing personnel.

(f) Contingency plan for anticipated construction difficulties.

(2) The quality assurance/quality control plan shall certify the design and construction of any of the following items which are incorporated into the residual waste landfill design:

(a) In-situ foundation preparation.

(b) Recompacted soil liner system.

(c) Flexible membrane liner.

(d) Leachate collection and management system.

(e) Cap system.

(f) Permanent ground water control structures.

(g) Explosive gas control, extraction and monitoring systems.

(h) Permanent surface water control structures.

(i) Permanent haul roads.

(j) Test pad.

(k) Other engineered components required by the approved permit or other authorizing document.

Effective:

Five Year Review (FYR) Dates: 01/29/2015

_____

Certification

_____

Date

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Appendix A

Equation (1) D = N * (6.6 x 10^{-9}) where:

D = Liner thickness (ft), not to exceed 5 feet for facilities regulated in accordance with paragraph (C)(1)(j)(iii) of this rule and not to exceed 3 feet for facilities regulated in accordance with paragraph (C)(1)(j)(ii) of this rule.

N = time (seconds), calculated in procedure (3)

Equation (2) T = D/AK where:

T = time (seconds)

D = thickness of geologic stratum (cm)

K = hydraulic conductivity of geologic stratum (cm/sec)

A = constant determined by type of geologic stratum where:

A = 2.0 for clay

A = 2.5 for silt

A = 3.5 for sand or gravel

A = 5.0 for fractured bedrock

A = the inverse of the porosity of the non- fractured bedrock material

Procedure:

(1) Calculate T for each geologic stratum that is to be present between the uppermost aquifer system and the base of the recompacted soil liner using equation (2).

(2) The values for T calculated in procedure (1) shall be summed to yield T for the entire section between the uppermost aquifer system and the base of the recompacted soil liner.

(3) Subtract T from 7.9 x 108 seconds to get N (seconds).

(4) Insert N into equation (1) to determine required liner thickness