*** DRAFT - NOT YET FILED ***

3745-27-08 **Sanitary landfill facility construction.**

(A) Applicability. The construction requirements for a sanitary landfill facility specified in this rule are applicable to a particular facility or permit to install application as specified in rules 3745-27-06, 3745-27-07, 3745-27-11, 3745-27-19, and 3745-27-20 of the Administrative Code.

[Comment: The construction requirements specified in this rule represent the minimum standards that must be met by all sanitary landfill facilities. Authorizing documents such as permits to install also establish construction requirements, but they may be different than the rule requirements based on site specific factors. Since the authorizing document must meet, at a minimum, the requirements in this rule, if there are differences between the requirements of this rule and the authorizing document for the facility, the compliance standard shall be based on the authorizing document. The owner or operator is required to comply with the approved authorizing documents unless changes are required by specific references in this rule or other applicable rules or authorized by a director's action.]

(B) Engineered components for sanitary landfill facilities. The owner or operator shall incorporate the following engineered components in the design and construction of a sanitary landfill facility:

(1) All sanitary landfill facilities, at a minimum, shall include the following:

(a) Survey marks.

(b) A prepared in-situ foundation.

(c) A composite liner system that includes the following:

(i) A recompacted soil liner.

(ii) A flexible membrane liner.

(d) A leachate collection and management system that includes the following:

(i) A leachate collection layer.

(ii) Leachate collection pipes.

(iii) A filter layer.

*** DRAFT - NOT YET FILED ***

(iv) A sump.

(v) Leachate conveyance apparatus.

(e) Surface water control structures including sedimentation ponds.

(f) A composite cap system that includes the following:

(i) A soil barrier layer.

(ii) A flexible membrane liner.

(iii) A drainage layer.

(iv) A cap protection layer.

(g) An explosive gas control system.

(h) Access roads.

(2) Supplemental engineered components that may be required to address site specific conditions include, but are not limited to, the following:

(a) Permanent ground water control structures to control the impact of ground waters on other engineered components.

(b) Structural fill for berms and subbase.

(c) Added geologic material to meet the isolation distance requirement of rule 3745-27-07 of the Administrative Code.

(d) Liner cushion layer.

(e) Leachate storage tanks, if there is no permitted discharge to a public sewer system or a permitted waste water treatment system.

(f) Separatory liner/leachate collection systems may include the following components:

*** DRAFT - NOT YET FILED ***

(i) A gas collection layer.

(ii) A recompacted soil liner.

(iii) A flexible membrane liner.

(iv) A leachate collection layer.

(v) Leachate collection pipes.

(vi) A filter layer.

(vii) A geosynthetic clay liner.

(g) Interim composite liner/leachate collection system that includes the following components:

(i) A recompacted soil liner.

(ii) A flexible membrane liner.

(iii) A leachate collection layer.

(iv) Leachate collection pipes.

(v) A filter layer.

(vi) A sump.

(vii) Leachate conveyance apparatus.

(h) A gas collection system.

(3) Optional engineered components that an owner or operator may propose for use in a sanitary landfill facility include, but are not limited to, the following:

(a) Geosynthetic clay liner in lieu of a portion of the recompacted soil liner of the composite liner system.

*** DRAFT - NOT YET FILED ***

(b) Geosynthetic clay liner in lieu of the recompacted soil barrier layer of the composite cap system.

(c) Engineered subbase for a geosynthetic clay liner in a composite cap system.

(d) Transitional cover.

(C) General design criteria. The objective of the design for any engineered component or system of components shall be to meet or exceed the specifications for design, construction and quality assurance testing required in paragraph (D) of this rule along with the following general design criteria:

(1) The composite liner system shall be designed to do the following:

(a) Serve as a barrier to prevent the discharge of any leachate to ground or surface waters.

(b) For new facilities or lateral expansions of existing facilities, the composite liner system shall have at least a 2.0 percent slope in all areas, except along flow lines augmented by leachate collection pipes, after accounting for one hundred percent of the primary consolidation settlement and the secondary consolidation settlement of the compressible materials beneath the facility which includes, as applicable, in-situ soil, added geologic material, structural fill material, and recompacted soil liner.

For the purposes of this paragraph, secondary settlement shall be calculated using a 100-year time frame or another time frame acceptable to the director.

(c) For existing facilities where an owner or operator proposes to vertically expand over a composite liner system that was constructed after December 31, 2003, the slope of the existing composite liner system located beneath the vertical expansion shall meet the design standard in paragraph (C)(1)(b) of this rule.

[Comment: When initially designing and constructing a composite liner system, a conservative approach may be necessary to account for further settlement of the underlying materials caused by any potential vertical expansion above the initial design.]

*** DRAFT - NOT YET FILED ***

[Comment: An owner or operator may revise the applicable authorizing document(s) or modify the facility, with ohio epa approval, to meet the design standard in paragraph (C)(1)(b) of this rule.]

(d) For existing facilities where an owner or operator proposes to vertically expand over a composite liner system that was constructed before December 31, 2003, the owner or operator shall demonstrate to the director that the existing composite liner system located beneath the vertical expansion maintains, at a minimum, positive drainage in the leachate collection system and has no more than one foot of head of leachate after accounting for the additional waste and one hundred percent of the primary consolidation settlement and the secondary consolidation settlement of the compressible materials beneath the facility which includes, as applicable, in-situ soil, added geologic material, structural fill material, and recompacted soil liner.

For the purposes of this paragraph, secondary settlement shall be calculated using a 100-year time frame or another time frame acceptable to the director.

(e) Have a maximum slope based on the following:

(i) Compaction equipment limitations.

(ii) Slope stability.

(2) The separatory liner/leachate collection system shall be designed to do the following:

(a) Serve as a barrier to direct all leachate from new waste placement into the leachate collection system associated with the vertical expansion and to manage any explosive gas generated from the waste placement below the barrier.

(b) Have at least a 10.0 percent constructed grade in all areas except along flow lines augmented by leachate collection pipes, or have some other minimum slope based on a design acceptable to the director.

(c) Have a maximum slope based on the following:

(i) Compaction equipment limitations.

*** DRAFT - NOT YET FILED ***

(ii) Slope stability.

(d) The leachate collection and management system portion of the separatory liner shall be designed to limit the level of leachate to a maximum of one foot on the separatory liner throughout the operation and post closure of the facility.

(e) Include a combination of engineered components as listed in paragraph (B)(2)(f) of this rule that will function throughout the operational life and post closure period of the landfill. Alternative specifications to those included in paragraph (D) of this rule may be proposed in any new permit or permit modification.

(f) Minimize the amount of waste filled beneath the separatory liner system needed to obtain the required minimum slope.

(3) The leachate collection and management system shall be designed to do the following:

(a) Any components located outside of the limits of solid waste placement shall be no less protective of the environment than the sanitary landfill facility by complying with this paragraph.

(b) The selection and specifications for the materials that will make up the leachate collection layer shall be protective of the flexible membrane liner or the design must include a liner cushion layer.

(c) Limit the level of leachate in areas other than sumps to a maximum of one foot throughout the operation and post closure of the facility.

For the purposes of this rule, a sump is an excavated depression of limited size that serves as a collection and transfer point for leachate.

(d) Have at least a 0.5 percent grade for the leachate collection pipes after accounting for one hundred percent of the primary consolidation settlement and the secondary consolidation settlement of the compressible materials beneath the facility which includes, as applicable, in-situ soil, added geologic material, structural fill material, and recompacted soil liner.

For the purposes of this paragraph, secondary settlement shall be calculated using a 100-year time frame or another time frame

*** DRAFT - NOT YET FILED ***

acceptable to the director.

(4) The composite cap system shall be designed to do the following:

(a) Minimize infiltration of surface water.

(b) Serve as a barrier to prevent leachate outbreaks.

(c) Have at least a 5.0 percent grade in all areas except where surface water control structures are located.

(d) Have a maximum slope based on the following:

(i) Compaction and maintenance equipment limitations.

(ii) Slope stability.

(e) Provide protection for all composite cap system components from the effects of the formation of landfill gas.

(5) If applicable, the design of the explosive gas control system may utilize a passive venting system or an active extraction system to satisfy air pollution control requirements and shall be designed to maintain explosive gas concentrations below the explosive gas threshold limits in rule 3745-27-12 of the Administrative Code.

(6) The design of all geosynthetic materials specified in the engineered components, including but not limited to, flexible membrane liners, geosynthetic clay liners, and geosynthetic drainage nets, shall not rely on any of the tensile qualities of these geosynthetic components.

(7) The design for the stability of all engineered components and the waste mass shall address any configuration throughout the applicable developmental and post closure periods. Potential failures associated with internal, interim and final slopes as these slopes are defined in rule 3745-27-06 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.

*** DRAFT - NOT YET FILED ***

(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

*** DRAFT - NOT YET FILED ***

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.]

(D) Design, construction and testing specifications. The owner or operator shall meet or exceed the following specifications in the design, construction, and quality assurance testing of all engineered components of a sanitary landfill facility.

[Comment: The order of the engineered components in this paragraph reflects a logical bottom to top or a typical construction sequencing approach. Reporting requirements will be dependent on which engineered components are being certified. In general, a test pad certification report submitted to Ohio EPA for written concurrence may be used repeatedly in future construction certifications provided the soil properties of the borrow soil remain the same. Pre-construction

*** DRAFT - NOT YET FILED ***

testing results for borrow soils or shear strength testing results for geosynthetic components may be submitted as often as necessary during the construction process to allow for their continued use. A single construction certification report for each construction project shall be submitted in accordance with rule 3745-27-19 of the Administrative Code to Ohio EPA for written concurrence with all quality assurance testing and for approval of all alterations that are included in the certification report.]

(1) 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

*** DRAFT - NOT YET FILED ***

one inch to five thousand feet horizontal.

[Comment: Certification of the establishment of survey marks should follow the requirements in paragraph (H)(6) of this rule.]

(2) For surface water control structures: surface water run-on and run-off control structures shall comply with the following:

(a) Accommodate the peak flow from the twenty-five year/twenty-four hour storm event.

(b) Minimize silting and scouring.

(c) Use non-mechanical means for all permanent structures.

(3) For sedimentation ponds: sedimentation ponds shall comply with the following:

(a) Minimum storage volume, excluding sediment volume, shall be based on the larger of the following:

(i) The calculated run-off volume from a ten year/twenty-four hour storm event.

(ii) The scheduled frequency of pond clean-out, that shall be no more often than once per year, multiplied by 0.125 acre-feet per year for each acre of disturbed area within the upstream drainage area.

(b) The principal spillway shall safely discharge the flow from a ten-year/twenty-four hour storm event using non-mechanical means.

(c) The inlet elevation of the emergency spillway shall provide flood storage with no flow entering the emergency spillway while allowing flow through the principal spillway during a twenty-five year/twenty-four hour storm event.

(d) The combination of principal and emergency spillways shall safely discharge the flow from a one hundred year/twenty-four hour storm event using non-mechanical means.

(e) The embankment design shall provide for no less than one foot net

*** DRAFT - NOT YET FILED ***

freeboard when flow is at the design depth, after allowance for embankment settlement.

(4) For permanent ground water control structures: 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, except if the recharge and discharge zone of the aquifer system are located entirely within the boundary of the sanitary landfill facility.

(5) For the in-situ foundation: the unconsolidated or consolidated stratigraphic units that make up the in-situ foundation shall comply with the following:

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

(b) Not be comprised of solid waste.

(c) Not have any abrupt changes in grade that may result in damage to the composite liner system.

(d) Be proof rolled, if applicable.

(e) Be determined to have adequate strength to satisfy bearing capacity and slope stability strength requirements.

(f) Have quality control testing of any stratigraphic units that have not been anticipated and that are more susceptible to slope failure than the stratigraphic units that were tested and reported in the permit to install. This testing shall be in accordance with the following:

(i) The effective shear strength of each unconsolidated stratigraphic unit that may be susceptible to slope failure and the recompacted soil liner shall be determined using ASTM D3080-98 (direct shear test) or ASTM D4767-95 (consolidated-undrained triaxial compression test), or ASTM D6467-99 (torsional ring shear test).

(ii) The undrained shear strength of all applicable unconsolidated stratigraphic units using fully saturated samples shall be determined using ASTM D2850-95 (unconsolidated-undrained triaxial compression).

*** DRAFT - NOT YET FILED ***

[Comment: Record drawings for the bottom of recompacted soil liner are required in the certification report. All necessary surveying should be completed before beginning construction of the recompacted soil liner.]

(6) For structural fill: rock fills or soil fills for a structural berm or subbase shall comply with the following:

(a) Be durable rock for rock fills only.

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

(c) Not be comprised of solid waste.

(d) Not have any abrupt changes in grade that may result in damage to the composite liner system.

(e) For soil fills, have pre-construction testing of the borrow soils performed on representative samples to determine the maximum dry density and optimum moisture content according to ASTM D698-00a (standard proctor), or ASTM D1557-00 (modified proctor) at a frequency of no less than once for every ten thousand cubic yards.

(f) Be constructed in lifts to achieve uniform compaction of soil fills. Each lift shall comply with the following:

(i) Be constructed in loose lifts of twelve inches or less.

(ii) Be compacted to at least ninety five percent of the maximum dry density as determined by ASTM D698-00a (standard proctor) or at least ninety percent of the maximum dry density as determined by ASTM D1557-00 (modified proctor).

(g) Be determined to have adequate strength to satisfy bearing capacity and slope stability strength requirements.

(h) Have quality control testing of the soil fills on the constructed lifts performed to determine the density and moisture content according to ASTM D2922-01 and ASTM D3017-01 (nuclear methods), ASTM D1556-00 (sand cone), ASTM D2167-94 (rubber balloon) or other methods acceptable to the director or his authorized representative at a

*** DRAFT - NOT YET FILED ***

frequency of no less than five tests per acre per lift. The locations of the individual tests shall be adequately spaced to represent the constructed area.

(7) For added geologic material: added geologic material shall comply with the following:

(a) Provide at least fifteen feet of isolation distance between the uppermost aquifer system and the bottom of the recompacted soil liner.

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

(c) Not be comprised of solid waste.

(d) Shall have low permeability, good compactability, cohesiveness, relatively uniform texture, and shall not contain large objects in such quantities as may interfere with its application and intended purpose. The soil shall be a well-compacted loam, silt loam, clay loam, silty clay loam, silty clay or other soil types that can achieve the intended purpose.

(e) Not have any abrupt changes in grade that may result in damage to the composite liner system.

(f) Have pre-construction testing of the borrow soils performed on representative samples to determine the following:

(i) The maximum dry density and optimum moisture content according to ASTM D698-00a (standard proctor), or ASTM D1557-00 (modified proctor) at a frequency of no less than once for every ten thousand cubic yards.

(ii) The recompacted laboratory permeability using ASTM D5084-00e1 (falling head) at a frequency of no less than once for every ten thousand cubic yards.

(iii) The grain size distribution according to ASTM D422-63 (sieve and hydrometer) at a frequency of no less than once for every three thousand cubic yards.

*** DRAFT - NOT YET FILED ***

(g) Be constructed in lifts to achieve uniform compaction. Each lift shall comply with the following:

(i) Be constructed in loose lifts of twelve inches or less.

(ii) Be constructed of a soil with a maximum clod size that does not exceed the lift thickness.

(iii) Be compacted to at least ninety five percent of the maximum dry density as determined by ASTM D698-00a (standard proctor) or at least ninety percent of the maximum dry density as determined by ASTM D1557-00 (modified proctor).

(iv) Be placed with a soil moisture content that shall not be less than two percent below or more than four percent above the optimum moisture content as determined by ASTM D698-00a or ASTM D1557-00.

(v) Have a maximum permeability of one times ten to the negative five centimeters per second ($1 \text{ X } 10^{-5}$ cm/sec).

(h) Be determined to have adequate strength to satisfy bearing capacity and slope stability strength requirements.

(i) Have quality control testing of the constructed lifts performed to determine the density and moisture content according to ASTM D2922-01 and ASTM D3017-01 (nuclear methods), ASTM D1556-00 (sand cone), ASTM D2167-92 (rubber balloon) or other methods acceptable to the director or his authorized representative at a frequency of no less than five tests per acre per lift. The locations of the individual tests shall be adequately spaced to represent the constructed area. Any penetrations shall be repaired using bentonite.

(8) For recompacted soil liners: the recompacted soil liner shall comply with the following:

(a) Be at least five feet thick or as follows:

(i) An alternate thickness, to be no less than three feet, based on the result of the calculations outlined in appendix I of this rule.

*** DRAFT - NOT YET FILED ***

(ii) Three feet thick if used in conjunction with a geosynthetic clay liner that meets the specifications in paragraph (D)(9) of this rule.

(iii) An alternate thickness, to be no less than one and one-half feet thick, based on the results of the calculations outlined in appendix I of this rule if used in conjunction with a geosynthetic clay liner that meets the specifications in paragraph (D)(9) of this rule.

(iv) Two feet thick for the recompacted soil liner component of an interim composite liner/leachate collection system.

(v) Two feet thick for the recompacted soil liner component of a separatory liner/leachate collection system.

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

(c) Not be comprised of solid waste.

(d) Be placed beneath all areas of waste placement.

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

(f) Have pre-construction testing of the borrow soils performed on representative samples and the results submitted to the appropriate Ohio EPA district office no later than seven days prior to the intended use of the material in the construction of the recompacted soil liner. The pre-construction testing shall determine the following:

(i) The maximum dry density and optimum moisture content according to ASTM D698-00a (standard proctor), or ASTM D1557-00 (modified proctor) at a frequency of no less than once for every one thousand five hundred cubic yards.

(ii) The grain size distribution according to ASTM D422-63 (sieve and hydrometer) at a frequency of no less than once for every one thousand five hundred cubic yards.

(iii) The atterberg limits according to ASTM D4318-00 at a frequency of no less than once for every one thousand five hundred cubic

*** DRAFT - NOT YET FILED ***

yards.

(iv) The recompacted laboratory permeability according to ASTM D5084-00e1 (falling head) at a frequency of no less than once for every ten thousand cubic yards.

(g) Be constructed in lifts to achieve uniform compaction. Each lift shall include the following:

(i) Be constructed with qualified soils and the corresponding construction details established by written concurrence from Ohio EPA with the test pad certification report required by paragraph (E) of this rule and the following specifications or an alternative to qualifying soils with a test pad 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 and the following specifications:

(a) With loose lifts of eight inches or less.

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

(c) With one hundred percent of the particles having a maximum dimension not greater than two inches.

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

(ii) Be compacted to at least ninety-five percent of the maximum dry density as determined by ASTM D698-00a (standard proctor) or at least ninety percent of the maximum dry density as determined by ASTM D1557-00 (modified proctor) or an alternative compaction specification approved by the director.

(iii) Be placed with a minimum soil moisture content that shall not be less than the optimum moisture content as determined by ASTM D698-00a or ASTM D1557-00 or an alternative soil moisture content specification approved by the director.

*** DRAFT - NOT YET FILED ***

(iv) Have a maximum permeability of one times ten to the negative seven centimeters per second (1 X 10^{-7} cm/sec).

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

(i) Be determined to have adequate strength to satisfy bearing capacity and slope stability strength requirements.

(j) Have quality control testing of the constructed lifts performed to determine the density and moisture content according to ASTM D2922-01 and ASTM D3017-01 (nuclear methods), ASTM D1556-00 (sand cone), ASTM D2167-94 (rubber balloon), or other methods acceptable to the director or his authorized representative at a frequency of no less than five times per acre per lift. The locations of the individual tests shall be adequately spaced to represent the constructed area. Any penetrations shall be repaired using bentonite.

(9) For geosynthetic clay liners: a geosynthetic clay liner used in lieu of part of the recompacted soil liner pursuant to paragraph (D)(8) of this rule, or in lieu of the recompacted soil barrier layer, pursuant to paragraph (D)(21) of this rule, shall comply with the following:

(a) Be negligibly permeable to fluid migration.

(b) Have a dry bentonite mass per unit area of at least 0.75 pounds per square foot at zero percent moisture content.

(c) Have pre-construction testing of the geosynthetic clay liner material performed on representative samples and the results submitted to the appropriate Ohio EPA district office no later than seven days prior to the intended use of the material. The pre-construction testing shall determine:

(i) The internal drained shear strength using ASTM D6243-98 (direct shear test) at least twice for the initial use and at least once for each subsequent construction event. Tests involving geosynthetic clay liner material shall be conducted with hydrated samples.

[Comment: If a shear stress point plots below the Mohr-Coulomb shear strength failure envelope defined by the required factor of

*** DRAFT - NOT YET FILED ***

safety, it will be considered a failed test.]

(ii) The dry bentonite mass (at zero percent moisture content) per square foot of geosynthetic clay liners according to ASTM D5993-99 at a frequency of no less than once per fifty thousand square feet.

(iii) The interface shear strength according to paragraph (G) of this rule.

(d) Be installed in the following manner:

(i) To allow no more than negligible amounts of leakage by a minimum overlap of six inches, or, for end-of-panel seams, a minimum overlap of twelve inches. Overlap shall be increased in accordance with manufacturer's specifications or to account for shrinkage due to weather conditions.

(ii) In accordance with the manufacturer's specifications in regards to handling and the use of granular or powdered bentonite to enhance bonding at the seams.

(iii) Above the recompacted soil liner when used in liner systems or above an engineered subbase pursuant to paragraph (D)(22) of this rule when used in cap systems. Geosynthetic clay liners without internal reinforcement shall not be used in areas beneath leachate collection piping, in sump areas, or on any slope with a grade that is steeper than ten percent.

(iv) On a surface that shall not have any sharp edged protrusions or any particles protruding more than one quarter of one inch.

(10) For flexible membrane liners. The flexible membrane liner shall comply with the following:

(a) Be, at a minimum, a sixty mil high density polyethylene (HDPE) geomembrane for composite liner systems or be, at a minimum, a forty mil geomembrane for composite cap systems or other materials and/or thicknesses acceptable to the director.

(b) Be physically and chemically resistant to attack by the solid waste, leachate, or other materials that may come in contact with it using U.S.

*** DRAFT - NOT YET FILED ***

EPA method 9090 or other documented data.

(c) Have pre-construction interface testing performed according to paragraph (G) of this rule.

(d) Be placed above and in direct and uniform contact with the recompacted soil liner or the recompacted soil barrier layer or the geosynthetic clay liner.

(e) 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 solid waste, leachate, or other materials that may come in contact with the seams.

(f) Have quality control testing in accordance with the following, unless the manufacturer's specifications for testing are more stringent, in which case the manufacturer's specifications shall be used:

(i) For the purpose of testing every seaming apparatus in use each day, peel tests according to an appropriate method shall be performed on scrap pieces of flexible membrane liner when an apparatus is started, operators change, an apparatus is restarted, or at the beginning of each seaming period.

(ii) Nondestructive testing shall be performed on one hundred percent of the flexible membrane liner seams.

(iii) Destructive testing for peel according to the appropriate ASTM method shall be performed on randomly selected samples at a frequency of no less than once per five hundred feet of seam completed by a particular seaming apparatus. 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.

(11) For the liner cushion layer: the liner cushion layer shall be placed above the flexible membrane liner and protect it from damage that may be caused by construction materials and activities and have pre-construction interface testing performed according to paragraph (G) of this rule.

(12) For the leachate collection layer: the leachate collection layer shall be placed

*** DRAFT - NOT YET FILED ***

above the composite liner system which may be protected by the cushion layer and shall comply with the following:

(a) Be comprised of granular materials that meet the following requirements:

(i) Have a minimum thickness of one foot.

(ii) Have no more than five percent of the particles, by weight, passing through the 200-mesh sieve.

(iii) Have no more than five percent carbonate content by weight.

(iv) Have a minimum permeability of one times ten to the negative two centimeters per second (1×10^{-2} cm/sec).

(v) Granular materials shall have quality control testing in accordance with the following at a frequency of no less than once for every three thousand cubic yards of material:

(a) Permeability using ASTM D2434-68 (constant head).

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

(c) Carbonate content using ASTM D3042-97 at a pH of 4.0.

(vi) An alternate material and/or thickness may be used provided that it is demonstrated to the satisfaction of the director or his authorized representative that the material meets the requirements of this paragraph. The appropriate quality control testing and frequency of testing needs to be approved by Ohio EPA prior to use.

(b) A geosynthetic drainage net used in lieu of a granular drainage layer shall meet the following requirements:

(i) Have a minimum transmissivity to ensure that the leachate collection system meets the one foot of head of leachate requirement of this rule. The transmissivity shall be adjusted for elastic deformation, creep deformation, biological clogging, and chemical clogging by using the appropriate reduction factors.

*** DRAFT - NOT YET FILED ***

(ii) The composite liner system must be protected from the intrusion of objects during construction and operation by at least twelve inches of permeable material acceptable to the director.

(iii) Have quality control testing for transmissivity using ASTM D4716-01 at the maximum projected load and a frequency of once per fifty thousand square feet.

(iv) Any geosynthetic materials shall have pre-construction interface testing performed according to paragraph (G) of this rule.

(13) For leachate collection pipes: the leachate collection pipes shall comply with the following:

(a) Be imbedded in the drainage layer.

(b) Be designed not to crush or deform under expected maximum loads and settlement to an extent where the crushing or deformation negatively impacts the performance of the leachate collection and management system.

If an owner or operator is proposing a vertical expansion over areas that have leachate collection pipes in place, the leachate collection pipes will be re-evaluated and this performance standard shall be applied to allow for any additional loads or settlement from the vertical expansion. A conservative design may be needed initially to prepare for any possible future expansion.

(c) Be provided with access for clean-out devices which shall be protected from differential settling.

(d) Have lengths and configurations that shall not exceed the capabilities of clean-out devices.

(e) Have joints sealed to prevent separation.

(f) Be physically and chemically resistant to attack by the solid waste, leachate, or other materials with which they may come into contact. Sealing material and means of access for cleanout devices shall also be resistant to physical and chemical attack by the solid waste, leachate, or other materials with which they may come into contact.

*** DRAFT - NOT YET FILED ***

(g) An alternative to leachate collection pipes may be used if it is demonstrated to the satisfaction of the director or his authorized representative that the means for leachate transport meet the requirements of this paragraph.

(14) For filter layers: the filter layer of the leachate collection and management system shall comply with the following:

(a) Be placed above the leachate collection layer and leachate collection pipes.

(b) Be designed to minimize clogging of the leachate collection layer, leachate collection pipes, and sumps.

(15) For sumps: the leachate collection and management system shall incorporate an adequate number of sumps that shall comply with the following:

(a) Be protected from adverse effects from leachate and differential settling.

(b) Be equipped with automatic high level alarms located no greater than one foot above the top elevation of the sump.

(16) For leachate conveyance apparatus: the leachate collection and management system shall incorporate adequate measures that will automatically remove leachate from the landfill to the leachate storage tank(s), a permitted discharge to a public sewer, or a permitted waste water treatment system to facilitate the transfer of leachate from the storage tank(s) for the purpose of disposal. Any leachate conveyance apparatus located outside of the limits of solid waste placement shall comply with the following:

(a) Be monitored, as required by the director or his authorized representative.

(b) Be double cased with a witness zone.

(c) Be protected from the effects of freezing temperatures, crushing, or excess deflection.

(17) For leachate storage tanks: leachate storage tanks shall have adequate storage capacity to receive the anticipated amount of leachate removed during normal operations from the leachate sumps to maintain a maximum one foot of head

*** DRAFT - NOT YET FILED ***

and at a minimum have at least one week of storage capacity using design assumptions simulating final closure completed in accordance with rule 3745-27-11 of the Administrative Code. Any leachate storage tanks located outside of the limits of solid waste placement shall be monitored, as required by the director or his authorized representative, and include one of the following:

(a) For above ground leachate storage tanks be provided with spill containment no less than one hundred ten percent of the tank volume.

(b) For underground leachate storage tanks, be double cased with a witness zone.

(18) For access roads: all access roads used for waste hauling that are constructed within the horizontal limits of waste placement shall comply with the following:

(a) Not have grades in excess of twelve percent.

(b) Be designed to be stable and to prevent damage to the liner or cap systems caused by the effects of traffic loading and braking or any other action.

(19) For transitional covers: within sixty days of a portion of the facility reaching final elevations, transitional cover, as specified in rule 3745-27-19 of the Administrative Code, shall be installed and comply with the following:

(a) A twenty-four inch thick layer of soil that shall be nonputrescible and have low permeability, good compactability, cohesiveness, and relatively uniform texture, and shall not contain large objects in such quantities as may interfere with its application and intended purpose. The soil shall be a well-compacted loam, silt loam, clay loam, silty clay loam, silty clay or other soil types that can achieve the intended purpose.

(b) The soil shall be of sufficient thickness and fertility to support vegetation and shall be seeded as soon as practicable. Healthy grasses or other vegetation shall form a complete and dense vegetative cover within one year of soil placement.

(c) In preparation for construction of the final cap system in accordance with this paragraph, the transitional cover shall be partially or completely

*** DRAFT - NOT YET FILED ***

removed or otherwise prepared as necessary for construction of the final cap system.

[Comment: The term transitional cover has replaced the term interim final cover.]

(20) For a gas collection system: the gas collection system shall be installed prior to the final cap system and shall comply with the following:

(a) Collect and transport gas and condensate without adversely impacting the final cap system.

(b) Facilitate maintenance to portions of the component without requiring the entire system to be closed down.

[Comment: Condensate may be allowed to remain in the waste mass provide that there is a composite liner and leachate collection system.]

(21) For cap soil barrier layers: design and construction of a recompacted soil barrier layer in the composite cap system shall comply with the following:

(a) Be at least one of the following:

(i) Eighteen inches thick.

(ii) A geosynthetic clay liner that complies with paragraph (D)(9) of this rule with an engineered subbase, constructed in accordance with paragraph (D)(22) of this rule.

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

(c) Not be comprised of solid waste.

(d) Be placed above all areas of waste placement.

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

(f) Have pre-construction testing of the borrow soils performed on representative samples and the results submitted to the appropriate Ohio

*** DRAFT - NOT YET FILED ***

EPA district office no later than seven days prior to the intended use of the material in the construction of the cap soil barrier layer. The pre-construction testing shall determine the following:

(i) The maximum dry density and optimum moisture content according to ASTM D698-00a (standard proctor), or ASTM D1557-00 (modified proctor) at a frequency of no less than once for every one thousand five hundred cubic yards.

(ii) The grain size distribution according to ASTM D422-63 (sieve and hydrometer) at a frequency of no less than once for every one thousand five hundred cubic yards.

(iii) The recompacted laboratory permeability using ASTM D5084-00e1 (falling head) at a frequency of no less than once for every ten thousand cubic yards.

(g) Be constructed in lifts to achieve uniform compaction. Each lift shall:

(i) Be constructed of soil in accordance with the following:

(a) With loose lifts of eight inches or less.

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

(c) With one hundred percent of the particles having a maximum dimension not greater than two inches.

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

(e) With at least fifty percent of the particles, by weight, passing through the 200-mesh screen.

(f) Alternative soil specifications may be used provided that 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 X 10^{-6} cm/sec.

*** DRAFT - NOT YET FILED ***

(ii) Be compacted to at least ninety five percent of the maximum dry density as determined by ASTM D698-00a (standard proctor) or at least ninety percent of the maximum dry density as determined by ASTM D1557-00 (modified proctor) or an alternative compaction specification approved by the director.

(iii) Be placed with a minimum soil moisture content that shall not be less than the optimum moisture content as determined by ASTM D698-00a (standard proctor), or ASTM D1557-00 (modified proctor) or an alternative moisture content specification approved by the director.

(iv) Have a maximum permeability of one times ten to the negative six centimeters per second (1×10^{-6} cm/sec).

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

(i) Have quality control testing of the constructed lifts performed to determine the density and moisture content according to ASTM D2922-01 and ASTM D3017-01 (nuclear methods), ASTM D1556-00 (sand cone), ASTM D2167-94 (rubber balloon) or other methods acceptable to the director or his authorized representative at a frequency of no less than five tests per acre per lift. The locations of the individual tests shall be adequately spaced to represent the constructed area. Any penetrations shall be repaired using bentonite.

[Comment: If an acceptable demonstration is made that the transitional cover can be prepared to function as a cap soil barrier layer, the director may approve an alteration for the use of the transitional cover materials in the demonstrated area.]

(22) For engineered subbases: if a geosynthetic clay liner is used in the composite cap system in accordance with paragraph (D)(21) of this rule, it shall be placed above an engineered subbase. Design and construction of the engineered subbase shall comply with the following:

(a) The thickness of the subbase shall be sufficient to achieve an evenly graded surface and shall be a minimum of twelve inches thick.

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

*** DRAFT - NOT YET FILED ***

(c) Not be comprised of solid waste.

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

(e) Not have any sharp edged protrusions or any particles protruding more than one quarter of one inch.

(f) Have pre-construction testing of the borrow soils performed on representative samples to determine the maximum dry density and optimum moisture content according to ASTM D698-00a (standard proctor), or ASTM D1557-00 (modified proctor) at a frequency of no less than once for every ten thousand cubic yards.

(g) Be constructed in lifts to achieve uniform compaction. Each lift shall include the following:

(i) Be constructed of soil as follows:

(a) Be constructed in loose lifts of twelve inches or less.

(b) Be constructed of a soil with a maximum clod size that does not exceed the lift thickness.

(ii) Be compacted to at least ninety five percent of the maximum dry density as determined by ASTM D698-00a (standard proctor) or at least ninety percent of the maximum dry density as determined by ASTM D1557-00 (modified proctor).

(h) Have quality control testing of the constructed lifts performed to determine the density and moisture content according to ASTM D2922-01 and ASTM D3017-01 (nuclear methods), ASTM D1556-00 (sand cone), ASTM D2167-94 (rubber balloon) or other methods acceptable to the director or his authorized representative at a frequency of no less than five tests per acre per lift. The locations of the individual tests shall be adequately spaced to represent the constructed area. Any penetrations shall be repaired using bentonite.

[Comment: If an acceptable demonstration is made that the transitional cover can be prepared to function as an engineered subbase, the director may approve an alteration for the use of the transitional cover materials

*** DRAFT - NOT YET FILED ***

in the demonstrated area.]

(23) For cap geosynthetic clay liners: a geosynthetic clay liner meeting the requirements of paragraph (D)(9) of this rule shall be placed above the engineered subgrade in the composite cap system.

(24) For cap flexible membrane liners: a flexible membrane liner meeting the requirements of paragraph (D)(10) of this rule shall be placed above the recompacted soil barrier layer or the geosynthetic clay liner in the composite cap system.

(25) For the cap drainage layers: the drainage layer for the composite cap system shall comply with the following:

(a) Be comprised of granular materials that meet the following requirements:

(i) Have a minimum thickness of one foot.

(ii) Not clog or freeze.

(iii) Not damage the underlying flexible membrane liner.

(iv) Have no more than five percent of the particles, by weight, passing through the 200-mesh sieve.

(v) Have no greater than ten percent carbonate content by weight.

(vi) Have a minimum permeability of one times ten to the negative three centimeters per second (1×10^{-3} cm/sec).

(vii) Granular materials shall have quality control testing in accordance with the following at a frequency of no less than once for every three thousand cubic yards of material:

(a) Permeability using ASTM D2434-68 (constant head).

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

(c) Carbonate content using ASTM D3042-97 at a pH of 4.0.

*** DRAFT - NOT YET FILED ***

(viii) An alternative material and/or thickness may be used provided it is demonstrated to the satisfaction of the director or his authorized representative that the material meets the requirements of this paragraph. The appropriate quality control testing and frequency of testing needs to be approved by Ohio EPA prior to use.

(b) A geosynthetic drainage net used in lieu of a granular drainage layer shall meet the following requirements:

(i) Have a minimum transmissivity to ensure that the cap system meets the slope stability requirements of this rule. The transmissivity shall be adjusted for elastic deformation, creep deformation, biological clogging, and chemical clogging by using the appropriate reduction factors.

(ii) The composite liner system must be protected from the intrusion of objects during construction.

(iii) Have quality control testing for transmissivity using ASTM D4716-01 at the maximum projected load and a frequency of once per fifty thousand square feet.

(iv) Any geosynthetic materials shall have pre-construction interface testing performed according to paragraph (G) of this rule.

(26) For cap protection layers: a cap protection layer shall comply with the following:

(a) Be placed above the cap drainage layer.

(b) Be a minimum of thirty-six inches thick for facilities located in the northern tier of counties in Ohio (Williams, Fulton, Lucas, Ottawa, Erie, Lorain, Cuyahoga, Lake, Geauga, and Ashtabula counties) and thirty inches thick for facilities located elsewhere in Ohio. The thickness of the drainage layer may be used to satisfy the thickness requirement of the cap protection layer.

(c) Have a maximum projected erosion rate of five tons per acre per year.

(d) Have sufficient fertility in the uppermost portion to support vegetation.

*** DRAFT - NOT YET FILED ***

(e) Be constructed as follows:

(i) With best management practices for erosion control.

(ii) In a manner that healthy grasses or other vegetation shall form a complete and dense vegetative cover within one year of placement.

(27) For explosive gas control systems: an explosive gas control system shall not compromise the integrity of the cap system, the leachate management system, or the composite liner system, and shall comply with the following:

(a) Accommodate waste settlement.

(b) Provide for the removal of condensate.

(c) Prevent lateral movement of explosive gas from the sanitary landfill facility.

(d) Prevent fires within the limits of solid waste placement.

(E) Test pad construction and certification. The construction of the recompacted soil liner shall be modeled by an approved test pad. The test pad shall determine the construction details required to achieve the permeability standard for recompacted soil liners and shall establish a set of parameters for certification of the soils to be used in the construction of the recompacted soil liner. Test pad construction and certification shall comply with the following:

(1) Be designed such that the proposed tests are appropriate and the results of each test are valid.

(2) Have an area large enough to perform valid field permeability testing and 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.

(3) Have a thickness of no less than thirty inches.

(4) Have the following pre-construction testing performed on representative samples of the test pad construction soils at a minimum frequency of twice

*** DRAFT - NOT YET FILED ***

per lift for:

(a) The maximum dry density and optimum moisture content according to ASTM D698-00a (standard proctor), or ASTM D1557-00 (modified proctor).

(b) Grain size distribution using ASTM D422-63 (sieve and hydrometer).

(c) Atterberg limits using ASTM D4318-00.

(5) Be constructed as follows:

(a) Prior to the construction of the sanitary landfill component that the test pad will models.

(b) The construction details include the following:

(i) The maximum loose lift thickness.

(ii) The minimum soil moisture content that shall not be less than the optimum moisture content as determined by ASTM D698-00a or ASTM D1557-00.

(iii) The minimum soil dry density that shall not be less than ninety five percent of the maximum "Standard Proctor Density" using ASTM D698-00a or at least ninety percent of the maximum "Modified Proctor Density" using ASTM D1557-00.

(iv) The specific type and weight of compaction equipment manufactured for the purpose of compacting cohesive soils.

(v) The minimum number of passes of the compaction equipment. For the purpose of this rule, one pass is defined as a single contact of the compactor over an area.

(6) Be reconstructed as follows:

(a) With new borrow soil as many times as necessary to meet the permeability requirement.

*** DRAFT - NOT YET FILED ***

(b) Whenever there is a significant change in soil material properties.

(c) Whenever the owner or operator would like to amend the construction details.

(7) Have quality control testing of the constructed lifts performed to determine the density and moisture content according to ASTM D2922-01 and ASTM D3017-01 (nuclear methods), ASTM D1556-00 (sand cone), ASTM D2167-94 (rubber balloon) or other methods acceptable to the director or his authorized representative at a frequency of no less than three tests per lift. The locations of the individual tests shall be adequately spaced to represent the constructed area. Any penetrations shall be repaired using bentonite.

(8) Have post-construction testing performed for field permeability using one of the following:

(a) ASTM D6391-99 (two stage borehole).

(b) ASTM D3385-94 (double ring infiltrometer).

(c) ASTM D5093-90 (sealed double ring infiltrometer).

(d) Other methods acceptable to the director or his authorized representative.

(9) Be described in a certification report, signed and sealed by a professional engineer registered in the state of Ohio, containing a narrative that proposes: the construction details, the range of soil properties that will be used to construct the recompacted soil liner, and the results of all the testing required by this paragraph. The report shall be submitted to the appropriate Ohio EPA district office for written concurrence no later than fourteen days prior to the intended construction of the recompacted soil liner that will be modeled by the test pad.

(10) An alternative to the test pads required by this rule may be used if it is demonstrated to the satisfaction of the director or his authorized representative that the alternative meets the permeability requirements in this rule.

(F) [Reserved.]

*** DRAFT - NOT YET FILED ***

(G) Pre-construction interface testing and reporting. The specific soils and representative samples of the geosynthetic materials that will be used at the site shall be tested for interface shear strength over the entire range of normal stresses that will develop at the facility. Prior to the initial use of each specific geosynthetic material(s) in the construction of engineered components at a facility, the appropriate shear strengths for all soil to geosynthetic and geosynthetic to geosynthetic interfaces that include the material(s) shall be determined at least twice using ASTM D5321-92 (direct shear test) or ASTM D6243-98 (direct shear test for GCL) and at least once for each subsequent construction event using samples of the materials identified by the initial two tests to be at the highest risk for slope failure. Tests involving the flexible membrane liner interface shall be conducted with a recompacted soil that has the highest moisture content and the lowest density specified for construction of the recompacted soil liner. Tests involving geosynthetic clay liner material shall be conducted with hydrated samples. The results of pre-construction testing required by this rule must meet all applicable specifications in this rule and the set of approved parameters in the permit to install application that were established by the slope stability analysis and shall be evaluated and signed and sealed by a professional engineer registered in the state of Ohio and submitted to the appropriate Ohio EPA district office no later than seven days prior to the intended use of the materials.

[Comment: If a shear stress point plots below the shear strength failure envelope defined by the required factor of safety, it will be considered a failed test.]

[Comment: In order to initially test a soil to geosynthetic interface, one should run two tests over the entire range of normal stress to determine the shear strength failure envelope of that interface. Each test should consist of a representative sample of soil and geosynthetic.]

(H) Construction certification report. Pursuant to rule 3745-27-19 of the Administrative Code, a construction certification report shall be prepared and signed and sealed by a professional engineer registered in the state of Ohio and other professionals skilled in the appropriate discipline(s) and submitted to Ohio EPA and to the approved health department. Copies of the daily construction activity logs must be kept at the facility and upon request made available to Ohio EPA. The construction certification report shall include the following:

(1) A narrative section that identifies the engineering components that were constructed during the construction event and includes the following:

(a) A summary of the design and construction specifications given in the approved permit to install and a comparison with the components that were constructed during the construction event.

*** DRAFT - NOT YET FILED ***

(b) A summary of how construction was impacted by weather and equipment limitations and other difficulties encountered.

(2) All alterations and other changes that relate to the installation of any of the components to be certified are to be presented as follows:

(a) A listing of all alterations previously concurred with by Ohio EPA.

(b) All alteration requests and supporting documentation which are proposed for concurrence. The alteration request shall be equivalent or more protective than the approved permit to install.

[Comment: Rule 3745-27-19 of the Administrative Code requires that the owner or operator obtain Ohio EPA's written concurrence with the certification report prior to placing waste in the phase. If an alteration will be submitted within a certification report, it is highly recommended that the appropriate district office of Ohio EPA be notified prior to construction. Ohio EPA may not concur with alterations submitted after they are constructed. If this occurs, reconstruction or amendment of the altered component will be required prior to waste placement.]

(c) A list of any other changes made by the owner or operator which do not require Ohio EPA concurrence but which affect construction or the record drawings.

[Comment: The listing of these changes is for Ohio EPA's informational purposes only.]

(3) Results of all testing required by this rule and the quality assurance/quality control plan for the construction of any engineered component or group of components. If the results of pre-construction testing of borrow soils were submitted in a format that is acceptable to Ohio EPA, only summary tables of data need to be included in the construction certification report.

However, if a quality assurance/quality control plan is not required by the applicable authorizing document(s), including an approved permit(s) to install, plan approval, operational report, or approved closure plan, the owner or operator shall include the results of testing, testing procedures, sampling frequency and location, parameters tested for, etc., performed to certify compliance with this rule.

[Comment: All quality assurance/quality control tests that do not meet the specifications outlined in this rule or the approved permit to install are failed

*** DRAFT - NOT YET FILED ***

tests that must be investigated and assessed. An area with a verified failure must be reconstructed to meet specifications. Reconstructed areas shall be retested at a frequency acceptable to the director. Reconstruction and retesting shall be performed in accordance with rule 3745-27-19 of the Administrative Code.]

(4) Results of all surveys required by this rule, the quality assurance/quality control plan, or the approved permit to install for the construction of any engineered component or group of components. Survey data shall at a minimum be reported in a table(s) at the northing and easting for each designated survey point established to be no more than one hundred feet apart. The northings and eastings shall be based on the grid system established in the permit in accordance with rule 3745-27-06 of the Administrative Code. If the permit to install does not establish a grid system, the owner or operator shall establish a grid system for the purposes of construction certification. Additional points should be established at grade breaks and other critical locations.

(a) For the purpose of confirming the constructed elevations of the composite liner system and its distance to the uppermost aquifer system, the bottom of recompacted soil liner elevations shall be compared to the elevations in the approved permit to install.

(b) The survey grid shall also be used to demonstrate the thickness of the following constructed components with a comparison of the constructed thickness to the thickness specified in the approved permit to install:

(i) Added geologic material.

(ii) The recompacted soil liner.

(iii) The leachate collection layer.

(iv) The separatory soil barrier layer.

(v) The separatory leachate collection layer

(vi) The cap drainage layer.

(vii) The cap protection layer.

(5) Record drawings of the constructed facility components showing the following:

*** DRAFT - NOT YET FILED ***

(a) Plan views with topographic representation with the elevations of the top of recompacted soil liner and the location of any berms and leachate collection pipes with inverts noted.

(b) Plan views with topographic representation with the elevations of the top of the separatory soil barrier layer and the location of any berms and leachate collection pipes with inverts noted.

(c) Plan views with topographic representation with the horizontal limits of all existing waste and the top elevations of the composite cap system and surface water control structures including permanent ditches to control run on and run off; and sedimentation ponds including the inlet and outlet; and any permanent ground water control structures.

(d) Plan views of the deployment of the flexible membrane liner panels and the location and identification of the destructive tests and all repairs.

(e) The location and as-built detail drawings of all components to be certified using the same views as required in rule 3745-27-06 of the Administrative Code.

(f) If the certification report is submitted for the composite cap system, cross sections showing the top elevations of the existing waste, top elevations of the composite cap system, and the elevations of the surface water management system. The cross sections shall be taken at the same locations and using the same scale as in the approved permit to install. Otherwise, the cross sections shall be taken at an interval no greater than every three hundred feet of length and width.

(6) After the initial construction and establishment of facility survey marks, the following information summarizing the activities performed to construct and establish the facility survey marks:

(a) An identification and description of the known control point(s) used to establish the horizontal and vertical coordinate(s) of the facility survey marks.

(b) The horizontal and vertical coordinates of the known control point(s) and facility survey marks.

(c) A summary of surveying activities performed in determining the

*** DRAFT - NOT YET FILED ***

coordinates of the facility survey marks.

(d) A copy of the 7.5 minute series quadrangle sheet(s) used in establishing the survey marks with the known control point(s) and the location of the facility survey marks clearly identified.

(e) A detailed drawing(s) illustrating the design of the facility survey marks, as constructed.

(7) Qualifications of testing personnel. A description of the experience, training, responsibilities in decision making, and other qualifications of the personnel that provided construction oversight and conducted all the testing on the engineered components for which the certification report is submitted.

(8) Documentation demonstrating that any oil or gas wells that have been identified within the limits of solid waste placement have been properly plugged and abandoned in accordance with Chapter 1509. of the Revised Code prior to any construction in the area of the well(s).

(9) A notarized statement that, to the best of the knowledge of the owner or operator, the certification report is true, accurate, and contains all information required by this rule and by a quality assurance/quality control plan.

[Comment: A recommended format for the certification report will be developed by Ohio EPA]