3745-512-10 **Shear strength evaluation and reporting.**

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, test methods, federal rules, and federal statutory provisions referenced in this rule, see rule 3745-500-03 of the Administrative Code titled "Incorporation by reference."]

(A) Any material used to an construct engineered component of the facility shall undergo a shear strength evaluation in accordance with this rule prior to use of the construction material. The owner or operator shall not use any material to construct the facility unless the results of the shear strength evaluation meet all applicable specifications in this rule and meet the material specifications established by the geotechnical and slope stability analyses in the authorizing document.

(B) The shear strength evaluation of the construction material shall be signed and sealed by a professional engineer.

(C) The owner or operator shall test representative samples of the specific soils and the geosynthetic materials used at the facility and use the results in accordance with the following:

(1) Prior to the initial use of each specific geosynthetic material in the construction of engineered components at a facility, the shear strength for all soil to geosynthetic and geosynthetic to geosynthetic interfaces that include the material shall be determined at least twice using ASTM D5321 (direct shear test) or ASTM D6243 (direct shear test for geosynthetic clay liner). Testing shall be conducted with the specific recompacted soil with the highest liquid limit expected to be used in the uppermost lift. Prior to each subsequent construction event, shear strength shall be determined at least once using samples of the materials identified by the initial two tests as being at the highest risk for interface failure.

(2) The tests of each interface required by paragraph (C)(1) of this rule shall be conducted to determine the shear strength failure envelope that represents the entire range of normal stresses that will be experienced by the interface during facility construction and disposal operations. Each test shall use representative samples of the materials that create the interface. If a shear stress point plots below the minimum shear strength failure envelope established in the stability analysis report in the authorizing document, the test is considered a failed test. If the authorizing document does not include a minimum shear strength envelope, then a shear strength failure envelope shall be developed in the manner established by rule 3745-511-40 of the Administrative Code.

(3) The results from tests required by paragraph (C)(1) of this rule for the flexible membrane liner interface with a liner system recompacted soil liner or cap

system recompacted soil layer shall be used to establish the lowest per cent compaction and the highest per cent above optimum moisture content to be used during construction of the recompacted soil liner and recompacted soil layer.

(4) If no recompacted soil liner is required and if a flexible membrane liner is required, the tests required by paragraph (C)(1) of this rule of the interface created by the soil that will be beneath and in contact with the flexible membrane liner shall use the following soils:

(a) For in situ foundation, the soil with the highest liquid limit that is acceptable for construction. Representative samples shall be compacted at four per cent above the optimum moisture content and at ninety-five per cent of the maximum density based on ASTM D698 (standard proctor).

(b) For added geologic material, structural fill, or embankment, the soil with the highest moisture content and lowest density that is acceptable for construction.

(5) Tests of interfaces with a geosynthetic clay liner shall be conducted using hydrated samples of the geosynthetic clay liner.

(D) The owner or operator shall test representative samples of the specific fine-grained soils to be used in the construction of an engineered component at the facility, excluding in situ foundation, and use the results in accordance with the following:

(1) Representative samples shall be compacted at the lowest per cent compaction and the highest per cent above optimum moisture content expected during construction. For recompacted soil liner material, samples from the test pad constructed in accordance with rule 3745-512-21 of the Administrative Code may be used instead of using remolded samples. The results from tests required by paragraphs (D)(2) and (D)(3) of this rule shall be used to establish the highest moisture content and the lowest density to be used during construction of the engineered component.

(2) Prior to the initial use of each specific fine-grained soil, determine the effective shear strength of the samples described in paragraph (D)(1) of this rule using ASTM D3080 (direct shear test), ASTM D4767 (consolidated-undrained triaxial compression test), or ASTM D6467 (torsional ring shear test). The tests required by this rule shall be conducted to determine the shear strength failure envelope that represents the entire range of normal stresses that will be experienced by the engineered component during facility construction and disposal operations. If a shear stress point plots below the minimum shear strength failure envelope established in the stability analysis report in the authorizing document, the test is considered a failed test. If the authorizing document does not include a minimum shear strength envelope, then a shear

strength failure envelope shall be developed in the manner established by rule 3745-511-40 of the Administrative Code

(3) Prior to the initial use of each specific fine-grained soil used in the construction of an engineered component under the disposal limits, determine the undrained shear strength of fully saturated samples described in paragraph (D)(1) of this rule using ASTM D2850 (unconsolidated-undrained triaxial compression).