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3745-511-25 Seepage force analysis and reporting.

(A) The seepage force analysis shall determine whether seepage forces exist, and if present, analyze those phases where the hydrostatic surface is determined to be higher than the basal elevations of any excavations within and adjacent to the disposal limits. The analysis of seepage forces shall demonstrate that the facility is designed to meet the factors of safety in paragraph (B) of this rule against the critical hydraulic gradient of the recompacted soil liner and the foundation soils arising from seepage forces caused by reaching or exceeding the critical hydraulic gradient.

(B) The factors of safety against the critical hydraulic gradient shall be the following:

(1) The factor of safety shall be 1.5 at all points along the basal elevations of all excavations within and adjacent to the disposal limits.

(2) If temporary or mechanical ground water control structures are necessary to meet the factor of safety in paragraph (B)(1) of this rule and a recompacted soil liner is a component of the liner system, the factor of safety shall be 2.0 at all points along the surface of the recompacted soil liner. The factor of safety for this paragraph shall not be based on any influence or depression of the hydrostatic surface caused by the operation or use of the temporary or mechanical ground water control structures.

(C) The seepage force analysis shall assess sources and steady state conditions including but not limited to the following:

(1) Unlined sediment and storm water management basins with hydrostatic head at the designed maximum operating pool level.

(2) Unlined ditches with hydrostatic head from full flow conditions.

(3) Surface waters of the state.

(4) Aquifers.

(5) Significant zones of saturation.

(D) The geotechnical and stability analyses report identified in rule 3745-511-10 of the Administrative Code shall contain a section titled "Seepage Forces Analysis" which shall include the following information:

(1) The scope, extent, and findings from the site investigation bearing on seepage forces.

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- (2) A description of the rationale used for the selection of the analysis input parameters.
- (3) A description of the method used to calculate the seepage gradients.
- (4) A description of the assessed failure modes and conditions including at a minimum the surface and subsurface sources for seepage gradients.
- (5) A description of the rationale used for the selection of the critical cross section analyzed. At a minimum, the location with the highest critical hydrostatic surface with the minimum distance between the effective source of seepage and the critical point being analyzed shall be included.
- (6) An isopach map depicting the differences between the highest critical hydrostatic surface and the surfaces required to be analyzed in accordance with paragraph (B) of this rule.
- (7) A drawing of each critical cross section that shows the details of the input information for the analysis model including the following:
 - (a) The material boundaries and the highest temporal hydrostatic surface.
 - (b) The applicable dimensions, including the depth of excavation, the depth to the top of the recompacted soil liner, the depth to saturation, the depth to the highest critical hydrostatic surface, and the depth to the top of the source of the hydrostatic head being analyzed.
 - (c) The material types.
 - (d) The in situ unit weight, saturated unit weight, specific gravity, and void ratio of the materials.
- (8) All inputs, outputs, and calculations used for the seepage force analysis and a drawing of the critical cross section showing the following as appropriate for the analytical method used:
 - (a) Flow net with boundary flow and equipotential lines.
 - (b) Phreatic or piezometric lines.
 - (c) Boundary conditions.
 - (d) Flow vectors and areas with the highest flow velocities.
 - (e) Points of critical seepage identifying areas with the highest exiting gradient with the gradient listed.

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(f) The in situ unit weight, saturated unit weight, specific gravity, and void ratio values used.