**Section 811.306 Liner Systems**

a) All units shall be equipped with a leachate drainage and collection system and a compacted earth liner designed as an integrated system in compliance with the requirements of this Section and of Sections 811.307 and 811.308.

b) The liner and leachate collection system shall be stable during all phases of construction and operation. The side slopes shall achieve a minimum static safety factor of 1.3 and a minimum seismic safety factor of 1.0 at all times.

c) The liner shall be designed to function for the entire design period.

d) Compacted Earth Liner Standards

1) The minimum allowable thickness shall be 1.52 meters (5 feet).

2) The liner shall be compacted to achieve a maximum hydraulic conductivity of 1 X 10-7 centimeters per second.

3) The construction and compaction of the liner shall be carried out in accordance with the construction quality assurance procedures of Subpart E so as to reduce void spaces and allow the liner to support the loadings imposed by the waste disposal operation without settling that causes or contributes to the failure of the leachate collection system.

4) The liner shall be constructed from materials whose properties are not affected by contact with the constituents of the leachate expected to be produced.

5) Alternative specifications, using standard construction techniques, for hydraulic conductivity and liner thickness may be utilized under the following conditions:

A) The liner thickness shall be no less than 1.52 meter (5 feet) unless a composite liner consisting of a geomembrane immediately overlying a compacted earth liner is installed. The following minimum standards shall apply for a composite liner:

i) the geomembrane shall be no less than 60 mils in thickness and meet the requirements of subsection (e); and

ii) the compacted earth liner shall be no less than 0.91 meter in thickness (3 feet) and meet the requirements of subsection (d)(2) through (d)(4).

B) The modified liner shall operate in conjunction with a leachate drainage and collection system to achieve equivalent or superior performance to the requirements of this subsection. Equivalent performance shall be evaluated at maximum annual leachate flow conditions.

e) Geomembrane Liners

1) Geomembranes may be used only in conjunction with a compacted earth liner system meeting the requirements of subsection (d) and a leachate drainage and collection system meeting the requirements of Sections 811.307 and 811.308.

2) The geomembrane shall be supported by a compacted base free from sharp objects. The geomembrane shall be chemically compatible with the supporting soil materials.

3) The geomembrane material shall be compatible with the leachate expected to be generated.

4) Geomembranes shall have sufficient strength and durability to function at the site for the design period under the maximum expected loadings imposed by the waste and equipment and stresses imposed by settlement, temperature, construction and operation.

5) Seams shall be made in the field according to the manufacturer's specifications. All sections shall be arranged so that the use of field seams is minimized and seams are oriented in the direction subject to the least amount of stress.

6) The leachate collection system shall be designed to avoid loss of leachate through openings in the geomembrane.

f) Slurry Trenches and Cutoff Walls Used to Prevent Migration of Leachate

1) Slurry trenches and cutoff walls built to contain leachate migration shall be used only in conjunction with a compacted earth liner and a leachate drainage system meeting the requirements of subsection (d) and Section 811.307 or as part of a remedial action required by Section 811.319.

2) Slurry trenches and cutoff walls shall extend into the bottom confining layer to a depth that will establish and maintain a continuous hydraulic connection and prevent seepage.

3) Exploration borings shall be drilled along the route of the slurry trench or cutoff wall to confirm the depth to the confining layer. In situ tests shall be conducted to determine the hydraulic conductivity of the confining layer.

4) Slurry trenches and cutoff walls shall be stable under all conditions during the design period of the facility. They shall not be susceptible to displacement or erosion under stress or hydraulic gradient.

5) Slurry trenches and cutoff walls shall be constructed in conformance to a construction quality assurance plan, pursuant to Subpart E, that insures that all material and construction methods meet design specifications.

g) The owner or operator may utilize liner configurations other than those specified in this Section, special construction techniques and admixtures provided that:

1) The alternative technology or material provides equivalent, or superior, performance to the requirements of this Section;

2) The technology or material has been successfully utilized in at least one application similar to the proposed application; and

3) Methods for manufacturing quality control and construction quality assurance can be implemented.