

LANDFILL LINER SYSTEM CHECKLIST

The purpose of this checklist is to prompt the designer or reviewer to consider aspects of design for the different components of landfill liner systems including Leachate Collection and Removal Systems (LCRS), and Leak Detection Systems (LDS).

1. Protective soil cover/ select waste layer.

- Will a protective soil cover or select waste layer Be used at this site? Y_____N_____N/A_____
- Does this layer meet the minimum thickness requirement if any? Y_____N_____N/A_____
- Is the material selected available in the vicinity? Y_____N_____N/A_____
- Is compaction specified using low ground pressure equipment? Y_____N_____N/A_____

2. Granular drainage layer, Leachate Collection and Removal System (LCRS).

- Will a granular drain be used at this site? Y_____N_____N/A_____
- Has the granular drainage layer been designed to limit the head build-up to less than 300 mm (12 in) on top of the liner? Y_____N_____N/A_____
- Is the hydraulic conductivity of the drainage material greater than 1×10^{-2} cm/sec? Y_____N_____N/A_____
- Does the granular drainage layer have a minimum thickness of 300 mm (12 in.)? Y_____N_____N/A_____
- Do the contract documents adequately specify material and installation requirements? Y_____N_____N/A_____
- Has a value engineering evaluation performed to replace or to lessen the design requirements of the granular drainage layer by using a drainage geocomposite? If “Yes” go to item (3). Y_____N_____N/A_____

3. Geocomposite drainage layer, Leachate Collection and Removal System (LCRS). (geonet with geotextile laminated to one or both sides)

- Will a geocomposite be used at this site? Y_____N_____N/A_____
- Have the soil retention properties of the geotextile been evaluated? Y_____N_____N/A_____
- Have the filtration requirements for the geotextile been evaluated? Y_____N_____N/A_____
- Has the survivability of the geotextile been evaluated? Y_____N_____N/A_____
- Has the transmissivity of the geocomposite been evaluated to limit the head within its thickness thus to ensure an unconfined flow)? Y_____N_____N/A_____
- Have the reduction factors for creep, intrusion, particulate clogging, biological and chemical clogging been considered in the hydraulic assessment of the geocomposite? Y_____N_____N/A_____
- Have load, gradient, seating period and boundary conditions been specified in the transmissivity requirements of the geocomposite? Y_____N_____N/A_____
- Has the interface frictional behavior of the geocomposite against adjacent layers been considered for stability analysis? Y_____N_____N/A_____
- Do the contract documents adequately specify material and installation requirements? Y_____N_____N/A_____

4. Collection piping system.

- Are drainage pipes sized and identified on the drawings? Y_____N_____N/A_____
- Has the equation for the piping spacing calculations been evaluated? (note that Moore's equation is outdated and its validity is questionable). Y_____N_____N/A_____
- Do the drainage layer collection points freely drain into perimeter ditches? Y_____N_____N/A_____
- Are the outlets of the drainage pipes placed above the bottom of the perimeter collection trench to prevent clogging? Y_____N_____N/A_____
- Have pipe material and installation requirements been adequately specified? Y_____N_____N/A_____

5. Geomembrane.

- Will a geomembrane be used at this site? Y_____N_____N/A_____
- Does the membrane need to be textured? Y_____N_____N/A_____
- Is the minimum geomembrane thickness met if any? Y_____N_____N/A_____
- Do the contract documents adequately specify material and installation requirements? Y_____N_____N/A_____

6. Compacted clay liner (CCL)

- Will a clay layer be used at this site? Y_____N_____N/A_____
- Does the clay layer have a saturated hydraulic conductivity of 1×10^{-7} cm/sec or less? Y_____N_____N/A_____
- Is the clay layer a minimum of 600 mm (2 ft) in thickness? Y_____N_____N/A_____
- Has a clay borrow source been identified and tested? Y_____N_____N/A_____
- Do the contract documents adequately specify material and installation requirements? Y_____N_____N/A_____

7. Geosynthetic clay liner (GCL).

- Will a GCL be used at this site? Y_____N_____N/A_____
- Will regulators allow the use of a GCL at this site? Y_____N_____N/A_____
- Do the contract documents adequately specify material and installation requirements? Y_____N_____N/A_____

8. Geonet/ geocomposite drainage layer, Leak Detection Layer if any (geonet/ geonet with geotextile laminated to one or both sides)

- Will a geonet/geocomposite be used at this site? (geonet can only be used when the two adjacent layers are both geomembranes) Y_____N_____N/A_____
- Have the soil retention properties of the geotextile been evaluated? Y_____N_____N/A_____
- Have the filtration requirements for the geotextile been evaluated? Y_____N_____N/A_____
- Has the survivability of the geotextile been evaluated? Y_____N_____N/A_____
- Has the transmissivity of the geonet/ geocomposite been evaluated to limit the head within its thickness? Y_____N_____N/A_____
- Have the reduction factors for creep, intrusion, particulate clogging, biological and chemical clogging been considered in the hydraulic assessment of the geocomposite? Y_____N_____N/A_____
- Have load, gradient, seating period and boundary

conditions been specified in the transmissivity requirements of the geocomposite?

- Has the leak detection time been calculated ? Y_____N_____N/A_____
- Has the Maximum Flow Capacity been calculated ? and the Action Leakage Rate been determined? Y_____N_____N/A_____
- Has the leakage through the secondary liner been assessed ? Y_____N_____N/A_____
- Has the interface frictional behavior of the geocomposite against adjacent layers been considered for stability analysis? Y_____N_____N/A_____
- Do the contract documents adequately specify material and installation requirements? Y_____N_____N/A_____

9. Granular drainage layer as a Leak Detection Layer

- Will a granular drain be used at this site? Y_____N_____N/A_____
 - Has the granular drainage layer been designed to limit the head build-up within the thickness of the layer? Y_____N_____N/A_____
 - Is the hydraulic conductivity of the drainage material greater than 1×10^{-2} cm/sec? Y_____N_____N/A_____
 - Does the granular drainage layer have a minimum thickness of 300 mm (12 in.)? Y_____N_____N/A_____
 - Has the leak detection time been calculated ? Y_____N_____N/A_____
 - Has the Maximum Flow Capacity been calculated ? and the Action Leakage Rate (ALR) been determined? Y_____N_____N/A_____
 - Has the leakage through the secondary liner been assessed ? Y_____N_____N/A_____
 - Do the contract documents adequately specify material and installation requirements? Y_____N_____N/A_____
 - Has a value engineering evaluation performed to replace the granular drainage layer with a drainage geonet/geocomposite? If “Yes” go to item (8). Y_____N_____N/A_____
- (note that a geosynthetic LDS provides a minimal head on the secondary liner, less storage capacity, and faster leakage detection time)

10. Subgrade.

- Has subgrade preparation been considered to minimize differential settlement underneath the liner? Y_____N_____N/A_____
- Is stabilizing the subgrade using geogrids need to be considered? Y_____N_____N/A_____
- Do the contract documents adequately specify the preparation and compaction of the subgrade? Y_____N_____N/A_____

References

- Department of the Army, U.S. Army Corps of Engineers Washington, DC 20314-1000, ELT 1110-1-162. CEMP-RT. Technical Letter No. 1110-1-162 Engineering and Design “*Checklist for Hazardous Waste Landfill Cover Design*”. APPENDIX C: LANDFILL COVER DESIGN CHECKLIST
- Giroud, J.P., Zornberg, J.G., and Zhao, A. (2000), “Hydraulic Design of Geosynthetic and Granular Liquid Collector Layers”, *Geosynthetics International*, special issue on Liquid Collection Layers, Vol. 7, Nos. 4-6.