



## Wrinkles in Landfill Flexible Membrane Liner Construction

### Rule Requirements

Flexible membrane liner (FML) is a component of the composite liner system required at municipal, industrial, and residual solid waste landfills. The municipal and industrial solid waste landfill rules require the FML to be in direct and uniform contact with the the recompacted soil liner, recompacted soil barrier layer, or geosynthetic clay liner beneath it [OAC 3745-27-08(C)(10)(d) and OAC 3745-29-08(C)(10)(d)]. The residual solid waste rules require the FML to be placed on the recompacted soil liner [OAC 3745-30-07(C)(2)].

For a cap system with an FML component, the municipal and industrial solid waste rules refer back to the composite liner FML rule with the same requirement for direct and uniform contact. The residual solid waste rules do not require an FML component in the cap system, but if one were proposed, the requirement for direct and uniform contact will likely be applied.

### Wrinkle Development and Consequences

When FML is installed, wrinkles can form, resulting in areas where the FML is not in direct and uniform contact with the underlying layer. If the FML is wrinkled when the drainage layer is installed the wrinkle will be encapsulated and the gap between the FML and the underlying material can remain even after waste placement.

The consequences of wrinkle development are diverse:

- 1) The crest of the wrinkle is subject to increased shear stress which could result in damage to the FML by cracking.
- 2) Should a breach in the FML develop (e.g. puncture, crack, or tear) at a wrinkle, the void under the wrinkle will likely fill with leachate and, as a preferential pathway, could result in a significant volume of leachate leaking through the liner system.
- 3) The interface shear test results may not be valid if the FML is not in contact with the underlying material, which could lead to a slope failure.

### Approaches to Minimize Wrinkles

There is no allowance in Ohio's solid waste rules for wrinkles by size (height, width, length), shape (able to fold over), or prevalence. Ohio EPA is aware that it is not uncommon for wrinkles to develop, even when care is taken during FML installation. It is key that wrinkles not be encapsulated when the drainage layer is placed. A number of strategies are available to the owner or operator to minimize wrinkle development.

- 1) Choose an FML material that is not as prone to wrinkle development as black HDPE, which experiences thermal expansion when exposed to direct sunlight. Examples of alternative FML material include PVC and white HDPE.
- 2) Implement a liner integrity survey to locate holes after the drainage layer is installed. A conductive FML may be used; other methods may require that water be present within the void to conduct the electrical charge through the hole.
- 3) Avoid placement of the drainage layer when wrinkles are present.
- 4) Cool down the FML with water to remove wrinkles before placement of the drainage layer.
- 5) Cut and repair the FML to remove wrinkles.

### Contact

For more information, contact the Authorizing Actions and Engineering Unit at (614) 644-2621.

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