



Wrinkles in Landfill Flexible Membrane Liner (FML) Construction

Placement of drainage or protective layer over FML is prohibited where wrinkles in the FML are greater than four inches in height.

Applicable Rules

MSW OAC 3745-27-08(D)(12), (24), (25)

IMW OAC 3745-30-07(D)(8), (9), (10)

Applicability

For facilities with permits predating the effective date of the updated MSW and IMW rules, the four-inch wrinkle height limit does not apply, the standard is direct and uniform contact (i.e. no wrinkles). The four-inch wrinkle height limit applies to facilities permitted after the effective date of the updated MSW and IMW rules and to facilities with a permit alteration to comply with the updated rule. Otherwise, the guidance provided in this document is appropriate in addressing wrinkles.

Wrinkle Development and Consequences

When FML is installed, wrinkles can form on exposed FML due to the sun's radiant heat and also due to gravity pulling on the FML on a side slope. The resulting wrinkle creates an area where the FML is not in direct and uniform contact with the underlying layer. If the FML is wrinkled when the drainage or protective layer is installed, the wrinkle will be encapsulated and the gap between the FML and the underlying material can remain even after waste placement. For wrinkles less than four inches in height, it is probable over time for the weight of the overlying material to flatten the wrinkle and the underlying clay layer to deform and fill in the wrinkle.

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. A protruding tall wrinkle can be damaged by an equipment blade.
3. Should a breach in the FML develop (e.g. puncture, crack, or tear) at a wrinkle, the void under the wrinkle can fill with leachate and, as a preferential pathway, result in a significant volume of leachate leaking through the liner system.
4. 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

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. Examples of alternative FML material include PVC and white HDPE.
2. Employ laborers to flatten wrinkles to less than four inches just before/ahead of drainage or protective layer placement.
3. Place drainage or protective layer in the direction of the unanchored runout to reduce the likelihood of entrapping large wrinkles.
4. To reduce the tendency of large wrinkles forming during material placement, the dozer operator can lift the blade at the end of the push to encapsulate wrinkles when they are smaller than four inches in height.
5. Cool down the FML with water to remove wrinkles before placement of the drainage or protective layer.

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Documentation of Wrinkle Compliance

The updated rule provision regarding the four-inch wrinkle limit does not change how a facility would have previously documented FML construction compliance. DMWM recommends use of field notes documenting that no wrinkles greater than four inches in height were encapsulated, the field notes may also note weather conditions, photographs may be taken of wrinkles with a ruler for scale, photographs may be taken to document wrinkle reduction methods (e.g. application of weight on the wrinkle to reduce height, pushing towards the unanchored runout), and third-party construction quality assurance personnel.

Contact

If you have questions regarding this document or would like additional information, please contact:

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Disclaimer

This document is intended for guidance purposes only. Completion of the activities and procedures outlined in this document shall not release an owner or operator from any requirement or obligation for complying with Ohio Revised Code (ORC) Chapter 3734, the OAC rules adopted thereunder, or any authorizing documents or orders issued thereunder, nor shall it prevent Ohio EPA from pursuing enforcement actions to require compliance with ORC Chapter 3734, the OAC rules or any authorizing documents or orders issued thereunder.