Maryland Department of the Environment

Permeability Testing for Oil Storage and Oil Handling Facilities

What You Need to Know

The purpose of this fact sheet is to provide guidance to oil storage and oil handling facility owners, operators, persons in charge and environmental professionals regarding the requirements for testing the permeability of materials that are used in spill containment areas. Permeability testing is required for various types of containment areas to verify compliance with the regulations stated in the Code of Maryland Regulations (COMAR) Title 26, subtitle 10.

Applicability

Who must comply with the permeability testing regulations and guidance?

- An owner, operator, and person in charge of the following facility types.
  - An oil storage or oil handling facility having a loading/unloading rack or transfer area.
  - An oil contaminated soil (OCS) facility.
  - An oil storage or oil handling facility with a shop-fabricated aboveground storage tank (AST) system that is required to have a secondary containment dike.
  - An oil storage or oil handling facility with a field-erected AST system that is required to have a secondary containment dike.

PERMEABILTY REQUIREMENTS

Application	COMAR Reference	Permeability Requirement
Loading/unloading rack or transfer area	26.10.01.18B(1)	• 10^{-7} centimeters per second (cm/s), or less
OSC facility – storage base	26.10.13.07A(1)	• 10^{-7} cm/s, or less
Secondary containment dikes associated with shop-fabricated ASTs	26.10.17.07D(10)	• Less than 10^{-4} cm/s, or • A product level drop rate of less than 1 cm per 3 hours
Secondary containment dikes associated with field-erected ASTs	26.10.18.06C(10)	• Less than 10^{-4} cm/s, or • A product level drop rate of less than 1 cm per 3 hours

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Materials

The acceptable impermeable materials that may be used for construction of a secondary containment dike area (must be compatible with type of fuel and be fire-rated):

- Compacted clay. If compacted clay is used, it must:
  - Have a minimum of 12 inches of compacted clay,
  - Be protected with cover material to prevent drying and erosion,
  - Be designed, inspected, and certified by a registered professional engineer (PE), and
  - Be tested after installation to meet the applicable permeability requirement
- A geosynthetic clay liner
- Concrete
- A synthetic membrane
- Fabricated steel

Testing for Permeability

Containment areas constructed of **concrete** or those with **geosynthetic clay liner** or a **synthetic membrane**:

- Newly constructed containment areas must submit the manufacturer's permeability certification and the PE's (e.g., design engineer) permeability certification to MDE for approval.
- Existing containment areas do not require permeability testing. However, the concrete or liner type must be evaluated by a PE to verify the appropriate type and proper installation methods. A complete report including photos and supporting documentation signed and sealed by the PE, must be submitted to MDE. The PE issued report should include the following statement or similar language: "It is the professional opinion of [name of PE], PE that the secondary containment dike meets the design and permeability requirements in COMAR [include appropriate COMAR citation]".
- Existing containment areas made from concrete or other paved materials shall not have any cracks (including hairlines), holes, penetration of the dike bed, spalling, or other forms of

damage that would compromise the containment area and prevent the containment of spills, releases, or discharges within the area. In addition, the presence of vegetation growing in or through the dike bed and walls, and in some cases, exterior is also not acceptable. If any of these issues are present within a containment area, it will be considered a failed containment area and the containment area shall be repaired or replaced within 90 days, as per COMAR 26.10.17.07E and COMAR 26.10.18.06I. The PE must consider the criteria mentioned when evaluating an existing dike and in their report.

Containment areas constructed of **earthen materials**:

- A secondary containment dike must be designed or evaluated by a PE to verify compliance with COMAR 26.10.17.07 and COMAR 26.10.18.06. A complete report including photos and supporting documentation signed and sealed by the PE, must be submitted to MDE. The PE issued report should include the following statement or a similar language: "It is the professional opinion of [name of PE], PE that the secondary containment dike meets the design and permeability requirements in COMAR [include appropriate COMAR citation]".
- For an existing earthen secondary containment dike that has not been previously tested for permeability, test the existing earthen containment area for permeability using the American Society for Testing and Materials (ASTM) standard explained below.
- Test a new earthen containment dike for permeability using the ASTM standard explained below prior to placing the associated AST or transfer area in-service.
- Containment areas using native soils, amended soils, or an imported clay liner require permeability testing. Soil samples are collected using thin-walled tube samplers according to ASTM Method D 1587. The soil sample is then analyzed to determine the vertical soil permeability using ASTM falling-head or constant head permeability test method D 5084. Thin-walled tube samples should be collected to a 3-feet depth below any cover material. The testing lab should log and classify the soil according to ASTM method D 2488. If the soil is homogeneous, only one permeability test is required per thin-walled tube sample. If the soil is heterogeneous, conduct a permeability test on each soil type as defined by ASTM method D 2488.
- At least three, thin-walled tube samples should be collected per containment area. One sample should be collected at the lowest point in the containment area. The remaining samples should

be triangulated across the entire area. If there are more than three ASTs in a single containment area, collect at least one sample per tank. Less frequent sampling may be approved on a site-by-site basis. Unusual site configurations or highly variable soil may require more sample locations.

- Submit the results of the permeability testing to MDE no later than 60 days after the test.
- The presence of vegetation growing in or through the dike bed and walls is not acceptable. If any of these issues are present within a containment area, it will be considered a failed containment area and the containment area shall be repaired or replaced within 90 days, as per.
- Previous permeability testing conducted according to any ASTM method may be approved by MDE.

Reporting Requirements

For the containment areas constructed of **concrete** or those with **geosynthetic clay liner** or a **synthetic membrane,** submit the following reports as applicable:

- Manufacturer's permeability certification
- PE's (e.g., design engineer) permeability certification
- PE's evaluation report of concrete or liner type including photos and supporting documentation
- Repair report of sealed cracks, holes, penetration of the dike, spalling, or other forms of damage
- Repair report of the dike post removal of vegetation growing in or through the dike

For the containment areas constructed of **earthen materials,** submit the following reports as applicable:

- PE's design or evaluation report of the secondary containment dike and permeability
- Permeability test reports
- Repair report of the containment area, holes, penetration of the dike, or other forms of damage
- Repair report of the dike post removal of vegetation growing in or through the dike

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Questions

For further information on the Permeability Testing for Oil Storage and Oil Handling Facilities, contact the Oil Control Program at 410-537-3442 or 1-800-633-6101, ext. 3442.

To report oil spills, releases, or discharges please call 1-866-633-4686, available 24 hours a day.

DISCLAIMER

The storage of petroleum products and the installation, maintenance, and inspection of storage systems is a hazardous endeavor. This fact sheet has been provided for informational purposes. This document is not intended to be, nor should it be interpreted as, a regulation as defined in Section 10-101, State Government Article. MDE encourages you to read and understand the regulations that govern the operation of aboveground and underground storage systems found in Code of Maryland Regulations 26.10. “Oil Pollution and Tank Management.”