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**GUIDELINES FOR DESIGN AND INSTALLATION OF IMPERVIOUS BARRIERS AND
SLOPE STABILIZATION FOR TITLE 5 SYSTEMS**

Effective date: March 1, 2002

Policy/SOP/Guideline #: BRP/DWM/WPeP/G02-1

Program Applicability: BRP, Watershed Permitting,
Title 5

Approved by: [signed]
Cynthia Giles,
Assistant Commissioner, BRP

Regulation Reference: 310 CMR 15.211(1)4,
310 CMR 15.255

Supersedes Policy/SOP/Guideline: NONE

PURPOSE:

These guidelines supplement Title 5, 310 CMR 15.255, which addresses systems constructed in fill. Specifically, this guidance contains design and installation criteria for impervious barriers, and slope stabilization when either is required by 310 CMR 15.255 in conjunction with a system constructed in fill. Additionally, this guidance supplements 310 CMR 15.211(1)[4], which requires slope stabilization for certain soil absorption systems adjacent to naturally occurring downhill slopes.

APPLICABILITY:

This document is a guide for Massachusetts Registered Professional Engineers (PE) and Massachusetts Registered Sanitarians (RS) who design Title 5 systems using impervious barriers, and for PE's that design impervious barriers using retaining walls, or structural barriers such as concrete retaining walls, and for boards of health and DEP staff who review applications for Title 5 systems and who observe and inspect the installation of Title 5 systems.

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INTRODUCTION:

Title 5, 310 CMR 15.255, addresses the construction of systems in fill. An impervious barrier is required for systems constructed in fill when the designer can not provide the minimum 15 foot horizontal distance between the edge of the top of the two inch layer of washed stone (peastone) cover over the soil absorption system, and the top of the sideslope. For a system constructed in fill, 310 CMR 15.255 requires slope stabilization, such as a concrete retaining wall, when the sideslopes to a soil absorption system are steeper than 3:1 (horizontal: vertical). Section 310 CMR 15.211(1)[4] requires slope stabilization when systems are located in an area adjacent to a naturally occurring downhill slope steeper than 3:1. When a naturally occurring downhill slope adjacent to a system is steeper than 3:1, Title 5 requires stabilization in accordance with accepted engineering practice which may include installation of a concrete retaining wall designed in accordance with 310 CMR 15.255(2)(a) through (f),

TEXT:

Impervious Barriers:

Pursuant to 310 CMR 15.255(2), an impervious barrier is required for a system constructed in fill when the designer can not provide a minimum distance of 15 feet between the edge of soil absorption system and the top of the side slope. Impervious barriers must also be incorporated into the design when a minimum 15-foot horizontal distance cannot be provided between the edge of the soil absorption system and an adjacent naturally occurring downhill slope. (see Figure 1)

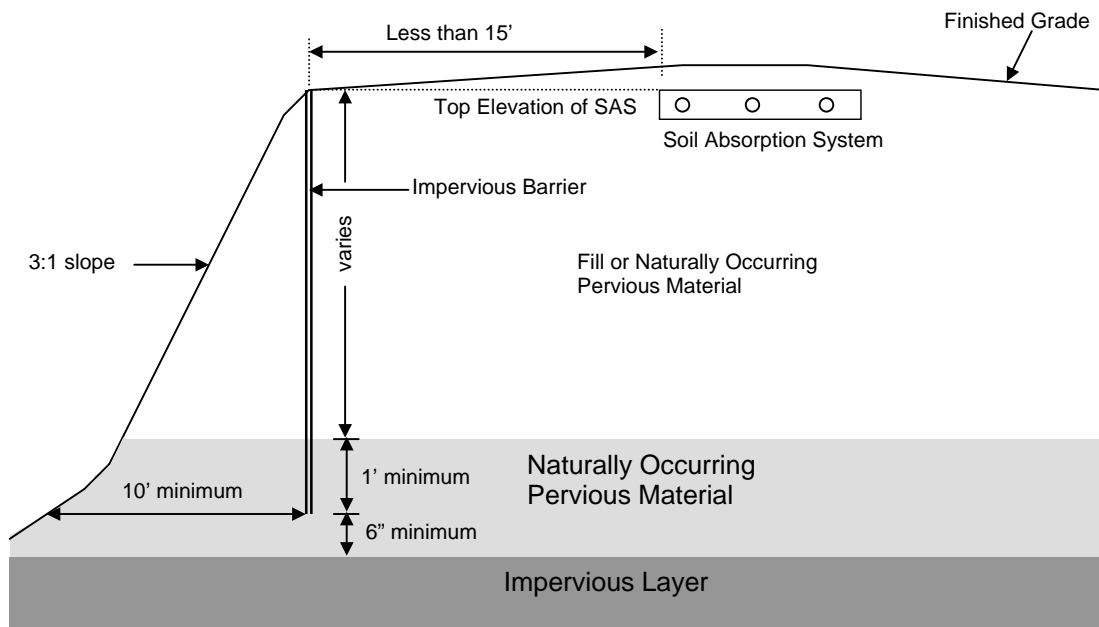


Figure 1: Impervious Barrier

Guidelines for the Design and Installation of Impervious Barriers

Swales or grading shall be incorporated into the design to prevent ponding by directing storm water away from the system. The grading shall be designed so that the stormwater is not diverted onto abutting properties in accordance with 310 CMR 15.255 (2).

Any impervious barrier may be designed by a Massachusetts Registered Professional Engineer. When the system has a design flow of less than 2,000 gallons per day, a Massachusetts Registered Sanitarian can design impervious barriers that do not include a retaining wall that provides any structural support for the slope.

Impervious barriers shall have the following design characteristics:

1. A top elevation that is at least as high as the top of the two-inch layer of peastone covering the pipes in the soil absorption system, or at least as high as the top of the chambers when leaching chambers are used.
2. The bottom of the impervious barrier shall extend to a minimum depth of at least one foot below the existing natural ground elevation.
3. There shall be at least a 10-foot horizontal distance between the bottom of the impervious barrier and the edge of the adjacent finished side slope.
4. In remedial situations where there is less than four feet of vertical distance between the bottom of the soil absorption system and ledge or other impervious strata, (consistent with the requirements for the granting of a variance specified in 310 CMR 15.415), the bottom of the impervious barrier should be at least six inches above the impervious strata to avoid impounding the treated effluent.

Clay barriers shall be:

1. constructed of compacted clay (conforming to NRCS classifications for clay, with a hydraulic conductivity no higher than 10^{-7} cm/sec);
2. at least two feet in width; and
3. covered with at least six inches of cover material (soil) and stabilized (e.g., vegetated) to prevent erosion of clay due to weather conditions.

Plastic membrane barriers shall be:

1. of sufficient tensile strength to withstand perforation, including cracking, tearing and breaking;
2. at least 40 mils in thickness, and have significant durability and resistance to the temperature and moisture conditions expected in the subsurface environment; and
3. installed without holes or gaps and so that perforations do not develop after installation.

Additionally, as specified in 310 CMR 15.255(2):

Materials for impervious barriers shall:

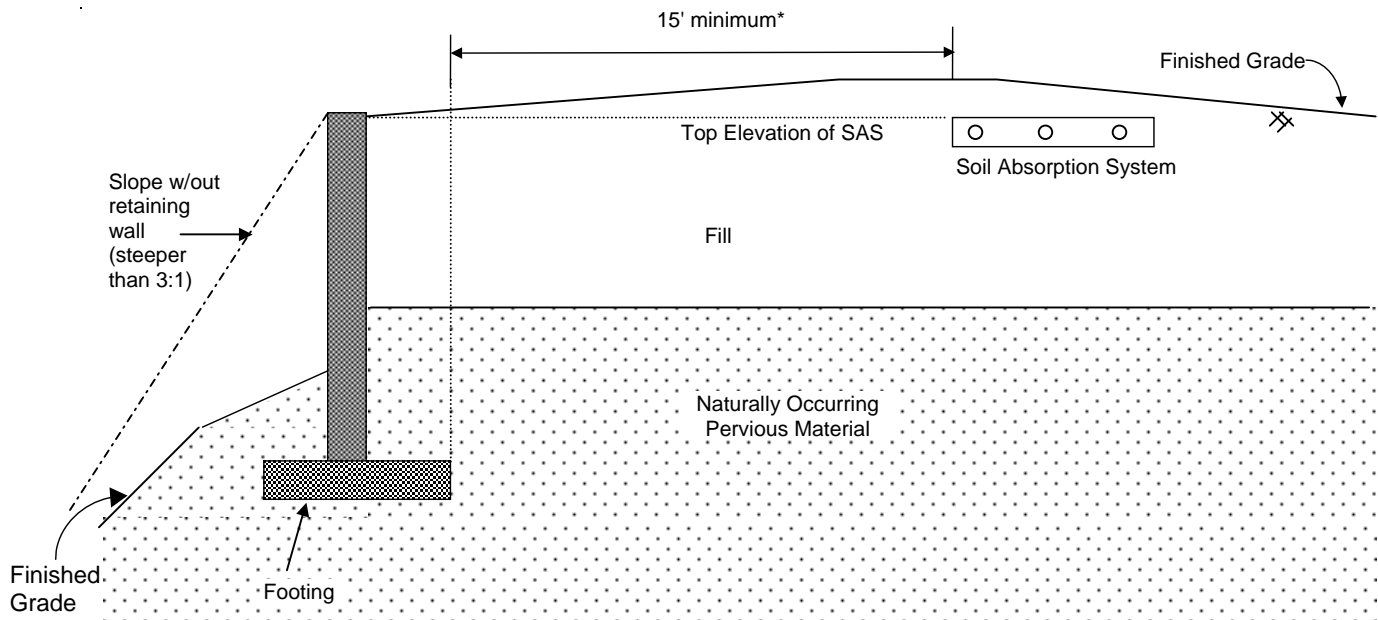
1. have no weep holes;
2. have a waterproof surface on at least the upgradient side, consisting of a durable waterproof lining or applied waterproof coating;
3. be anchored or reinforced as necessary to maintain structural integrity; and
4. not allow seepage or deteriorate over time.

Impervious Barrier with Retaining Wall:

An impervious barrier, as an integral part of a retaining wall, is required when both the horizontal distance between the edges of the two inch layer of washed peastone and the adjacent side slope can not be met and the side slope is steeper than 3:1 (310 CMR 15.255(2)). The criteria listed in this guidance for impervious barriers shall also apply to impervious barriers using retaining walls.

The following conditions also apply to retaining walls used only for structural purposes:

1. Materials used shall be structurally sound, non-degradable and waterproof. The structure shall have no weep holes when used as an impervious barrier.
2. It shall be designed by a Massachusetts Registered Professional Engineer, consistent with the provisions in 310 CMR 15.255(2)(a).
3. The horizontal distance from the edge of the SAS to the retaining wall shall be measured from the SAS to the closest edge of the footing if a footing is used.
4. In accordance with 310 CMR 15.255(2)(c), a Massachusetts Registered Professional Engineer shall design and inspect the installation and construction of the impervious barrier using a retaining wall or a retaining wall, and shall certify, in writing, that the structure has been constructed according to the approved design. The written certification shall be submitted to the approving authority prior to the issuance of the Certificate of Compliance.



*impervious barrier necessary if less than 15'

Figure 2: Typical Retaining Wall without Impervious Barrier

Construction

Construction of any impervious barrier, impervious barrier and retaining wall, or retaining wall alone, shall follow accepted engineering practice. They shall not be constructed during weather conditions that may prevent the proper installation of the structure. Extreme temperatures may affect newly poured concrete, for example, and may cause a membrane liner material to become overly inflexible, brittle or weak. Wet conditions may prevent the application of waterproof coatings or the ability to properly compact clays. Structures shall not be backfilled without inspection by the designer and the approving authority. The owner shall not modify the impervious barrier, or retaining structures without approval of the designer and without receiving appropriate approvals from the Board of Health or DEP (when DEP approval is required).

Engineers, Registered Sanitarians and system installers should review and be fully aware of state and local building codes that contain requirements applicable to retaining walls and other structures used for slope stabilization.

In accordance with 310 CMR 15.255(2)(c), an as-built plan shall be prepared and the designer shall certify that the impervious barrier, and/or retaining structure has been constructed in accordance with the approved plan. These plans must be submitted to the approving authority.