**DSIWM GUIDANCE DOCUMENT**
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SUBJECT: Cap System Designs Without Drainage Layers

GUIDANCE NUMBER: 0530

REFERENCE:

| Municipal Solid Waste | Industrial Solid Waste | Residual Solid Waste |
|---|---|---|
| OAC 3745-27-08(C)(15)(c)<br>OAC 3745-27-08(C)(16)(b) | OAC 3745-29-08(C)(16)(b) | N/A |

CROSS REFERENCES (OTHER GUIDANCE): None

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## I. PURPOSE

The purpose of this guidance document is to clarify under what circumstances an exemption for the drainage layer in a 1990 or 1994 cap system may be approvable.

## II. APPLICABILITY

This guidance document is applicable to owners and operators of municipal solid waste landfill facilities (MSWLFs) and industrial solid waste landfill facilities (ISWLFs) that were operating prior to the effective date of the 1990 solid waste rules.

## III. BACKGROUND

OAC 3745-27-08(C)(15)(c) and (C)(16)(b) and 3745-29-08(C)(16)(b) require owners and operators of MSWLFs and ISWLFs, respectively, to include as a component of the composite cap system, "a drainage layer that is either a minimum of twelve inches of granular material, constructed in accordance with the specifications in paragraph (C)(4)(a) of this rule; or, a drainage net that has equivalent performance capabilities as the granular material constructed in accordance with paragraph (C)(4)(a) of this rule."

Although drainage layers in cap systems are required engineered components of MSWLFs and ISWLFS, as stated above by the OAC, and have been since 1990, such layers are not required in the federal regulations. The purpose of the drainage layer in the cap system is to collect and remove surface water that has infiltrated through the vegetative and frost protection layers. Removal of this water is necessary for two reasons: (1) to minimize the amount that infiltrates the barrier layer and into the landfill creating leachate which must be dealt with; and (2) to provide greater stability to the cap system by removing excess water and preventing saturated conditions which could cause a slope failure of the cap system.

In general, a properly designed drainage system will enhance the effectiveness of the overall cap system. Under certain circumstances, however, DSIWM has found that the presence of the drainage layer causes problems which outweigh its benefits. In this circumstances, DSIWM has historically recommended for approval cap systems where soil has been substituted for the drainage layer. Such circumstances were more prevalent when existing sanitary landfill facilities were required to upgrade their cap systems to meet the requirements of the 1990 solid waste rules. DSIWM anticipates that in the future fewer landfills will experience difficulties incorporating drainage layers into the cap system design.

OAC 3745-27-08(C)(15)(d) and (C)(16)(d) and 3745-29-08(C)(16)(c) require that the landfill's cap system contain a frost protection layer that is either thirty or thirty-six inches thick, depending on the county in which the landfill is located. When twelve inches of granular drainage material is used in the drainage layer, the drainage material can be used as the first twelve inches of the required frost protection layer. The remaining eighteen to twenty-four inches of frost protection would be comprised of vegetative layer material. Otherwise, without the granular drainage material, the cap is to be constructed with a vegetative layer that is either thirty or thirty-six inches thick, as appropriate.

In order to receive authorization from the Director of the Ohio EPA to design and construct a 1990 or 1994 cap system without a drainage layer, it is necessary to apply for and receive an exemption from OAC 3745-27-08(C)(15)(c) or 3745-27-08(C)(16)(b) for a MSWLF or 3745-29-08(C)(16)(b) for an ISWLF.

In determining whether or not to approve an exemption from the requirement to have a drainage layer, there are three basic conditions which will be considered. These conditions are based on situations for which the Ohio EPA has historically allowed the substitution of soil for granular drainage material in the drainage layer. Whether or not the exemption request is approved will be determined on a case by case basis by applying the criteria associated with the following three situations:

1. A portion of the SLF is covered by a 1976 cap (i.e. two feet of soil). DSIWM recognizes that in certain situations, placing a 1990 or 1994 cap adjacent to an existing 1976 cap could result in internal ponding of water in the drainage layer. The boundary at which the drainage layer of the 1990 or 1994 cap meets the 1976 cap could act as a barrier to the free movement of water causing water to be trapped in the drainage layer. Although the cap system could be designed to provide an outlet for the water trapped in the 1990/1994 cap, there is the possibility that the

outlet design could fail. DSIWM recognizes that this failure could result in cap problems (e.g. ponding, slope failure, etc.) that would be more detrimental than not having a drainage layer.

Ponding of water resulting from outlet failure could exacerbate differential settlement in the cap system. Portions of the landfill underneath the ponded area may settle faster due to increased infiltration than will portions underneath well-drained areas. As portions of the facility settle more than others, the integrity of the engineered components of the cap system is jeopardized. If a break occurs in the drainage layer due to differential settlement, the probability of having ponding and leachate outbreaks in the cap is increased. Breaks in the other cap components (barrier layer, etc.) resulting from differential settlement could detrimentally affect the effectiveness of the cap system to prevent infiltration of water into the landfill.

2. The slope of the 1990 or 1994 cap is steep. As the steepness of the cap slope increases, less infiltration of water through the cap may occur due to increased run-off. Therefore, as the slope increases, the need for and benefit of having a drainage layer decrease. The determination of whether a cap is steep enough to warrant forgoing the drainage layer will be dependent upon the specific characteristics of the site.

   Another factor related to slope steepness is the stability of the drainage material on the slope. Some slopes are so steep as to preclude the placement of granular drainage material. In these cases, it may be possible to substitute a geonet or drainage blanket for the granular drainage material. If the engineering and construction of the facility is such that a drainage blanket or geonet is not practical or feasible either, then a drainage layer may not be required in these areas. However, saturated conditions need to be taken into account as a cap system without a drainage layer may not meet stability requirements. Depending on the configuration of the slopes throughout the remainder of the cap, a drainage layer may be required for portions of the facility.

3. The underlying area of the SLF was not constructed with a leachate collection system. In extreme cases, rising leachate levels could cause leachate outbreaks to occur in the drainage layer. Because of the high permeability of the drainage material, it could be very difficult to determine the exact location of the leachate outbreak.

## IV. PROCEDURE

In order to design and construct a cap system without a drainage layer, the owner or operator must apply for and receive an exemption from OAC 3745-27-08(C)(15)(c) or 3745-27-08(C)(16)(b), if for a MSWLF or OAC 3745-29-08(C)(16)(b) if for an ISWLF. The determination as to whether or not to grant the exemption will be made on a case by case basis, will be site specific, and will take into account the factors that were discussed in the background section.

If, upon review, it is determined that the presence of a drainage layer to be more detrimental than its absence, the owner or operator may be authorized to replace the drainage layer with soil. Again, this determination will be made on a case by case basis and will depend on the specific circumstances present at each individual site.

## V. POINT OF CONTACT

Engineering - Policy Unit, Supervisor (614) 728-5373.