

Georgia Department of Natural Resources

Georgia Environmental Protection Division

Solid Waste Management Program

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GUIDANCE DOCUMENT

INSTALLATION OF THE FINAL COVER FOR AN UNLINED LANDFILL

LEGAL AUTHORITY: RULES OF SOLID WASTE MANAGEMENT 391-3-4-.11

REFERENCES:

**a.Subtitle D Technical Training Manual Chapter 3
Construction Quality Assurance**

b.EPD Solid Waste Permitting Guidance Document

**c.Technical Guidance Document: Quality Assurance and
Quality Control for Waste Containment Facilities Chapter 2**

GENERAL

In order to assure compliance with the Georgia Rules of Solid Waste Management Chapter 391-3-4-.11, for the closure of municipal solid waste landfills, a Construction Quality Assurance (CQA) program should be implemented by the landfill owner. This program must be designed so that sufficient quantitative information is generated to ensure that the closure of the MSWL meets or exceeds the specified design requirements. The quantitative information must be submitted to and accepted by the Environmental Protection Division (EPD) as part of the Closure Certification package, **prior** to the issuance of a Closure Certificate.

This document has been prepared assuming a conventional closure cap consisting of 18 inches of an infiltration layer and 6 inches of an erosion layer. However, it is understood that some facilities, at the direction of their engineering consultant, may require somewhat thicker caps to accommodate local field conditions. The specific testing criteria and other recommendations contained within this document have been established to provide a minimum level of guidance for meeting the closure design requirements. Site specific conditions requiring a greater level of quality assurance and/or a more stringent cap design should take precedent.

Please be advised that this document is intended to provide a minimum level of **guidance** in meeting the permeability requirements. If, as recommended by a professional engineer, an alternate schedule of testing is desired, one may be granted by applying for one prior to construction activities.

CONSTRUCTION QUALITY ASSURANCE PROGRAM (CQA)

Requirements of the CQA program should be outlined in detail through a document that should be put together by an independent consultant. The purpose for this is to ensure that all parties bidding on the closure activities, are basing their cost estimates on **identical** scopes of work. The CQA plan **does not** have to be submitted to EPD for approval. It may be implemented upon its acceptance by the permittee.

At a minimum the CQA plan should include the following:

- a. approximate estimates for required closure materials (topsoil, clay, rip-rap, synthetic materials...etc),
- b. detailed description of cover installation procedures (including procedures for repairing areas that fail the testing criteria),
- c. testing procedures and frequency for cover material as established by this document.

The CQA plan should describe any other work which the owner/operator desires to have performed by the general closure contractor, such as the removal or demolition of on-site structures, installation of fencing, removal of UST's (if appropriate), construction of drainage structures, repair or construction of sediment ponds, litter pick-up...etc.

SOIL BRIDGING

Due to the variations in achieved waste compaction ratios and local geographical or physical conditions, it may be necessary to construct a soil "**bridging**" layer, prior to the installation of the infiltration layer. This bridging layer is intended to act as a foundation or base upon which to construct the closure cap. It is recommended that if a bridging layer is used, it be comprised of 18-24 inches of clean earth meeting the following criteria:

- a. capable of covering a given area without change in composition due to rain heat cold or other climactic conditions,
- b. must compact well and preclude the excessive infiltration of water,
- c. must be substantially free of organic material, foreign debris and rock fragments greater than 3 inches in diameter,
- d. must be proof rolled prior to construction of infiltration layer.

ALTERNATE FINAL COVER

If, due to physical, geographical, economic or other reasons, it is desired to forego installation of the conventional final cover system, a synthetic cap such as flexible membrane liners, a soil bentonite mixture...etc may be used as an alternative. However, any alternate design must meet the same performance requirements (slope stability, infiltration, etc...) as specified by the Rules of Solid Waste Management Chapter 391-3-4-1.1. Additionally, prior to the construction of an alternate final cover design, proper supporting documentation verifying the equivalence to the standard final cover design, must be submitted and approved by EPD.

INSTALLATION RECOMMENDATIONS

1. The infiltration layer, erosion layer, and bridging layer if used, are to be free of rock, debris, organic material and other foreign matter. The maximum rock size is not to exceed 3" in diameter for the erosion layer and 3/8" in diameter for the infiltration layer. The installation of the clay should be accomplished by systematically placing and compacting the material in no more than 6" lifts. The moisture content of the clay material should be controlled at the direction of the engineer, to ensure that the material meets the required density.
2. The maximum area that should be worked at any one time is recommended to be limited to 5 acres. An area of this size should be fully completed, with the erosion layer, prior to commencing cap construction activities in the next area. Sequencing of construction should be established to ensure the efficient progression of construction activities.
3. Visual inspections of the materials entering the site should be performed for changes in color or texture, in addition to any foreign debris, organic matter and rocks.
4. If necessary, clay should be mixed by disc-harrowing or an equivalent method to insure a homogenous consistency. Clod sizes should not exceed 3" in diameter prior to compaction.
5. Density tests on the clay layer and moisture tests should be conducted in accordance with TABLE 1 for each compacted lift on a maximum 200 foot grid pattern. Undisturbed samples using a thin walled tube sampler should also be taken at a minimum frequency of one per 40000 sq ft per lift on a 200 foot grid pattern. A decreased sampling frequency may be allowed, on a site specific basis, dependent upon the variability and overall quality of the borrow soils. Laboratory tests on the resulting undisturbed samples are to be performed by an independent testing lab.

6. Upon the extraction of an undisturbed sample, the sidewalls of the remaining hole should be scored and the hole properly filled with clay or a soil/bentonite mixture and hand tamped. To ensure proper repair, a density test should be performed at the sample location. The repaired hole should also be void of any flaws detrimental to permeability such as gaps, cracks, rocks, roots and miscellaneous debris.
7. If in-situ density tests do not meet the minimum requirements, additional tests should be performed to determine the extent of the failed area. Re-compaction of the failed area should then be performed. Following this, the area should be retested to ensure that the specified requirements are met. This procedure may have to be repeated, if the area continues to fail the minimum testing requirements.
8. If a permeability sample fails to meet the minimum hydraulic conductivity requirements, at least five replicate samples should be obtained in the immediate vicinity of the failed test. Should the replicate samples confirm the failure of the clay to meet specifications, the area of the failure should be localized and reconstructed. This area should then be retested.

**CLOSURE CERTIFICATION FOR SUBTITLE D FINAL COVER IN-PLACE BETWEEN
JUNE 27, 1993 - MAY 15, 1994**

If, due to implementation of a Subtitle D final cover for a facility before the development of this guidance document, the tests required in this document were not performed in full, testing will still be required to ensure that the minimum permeability requirements have been met. For those facilities with a Subtitle D final cover in-place or in the process of completion, a minimum of one permeability test per 40000 sq ft will be required to certify the conditions of Subtitle D have been met. These results will be submitted to EPD, along with all other closure documentation, for review.

TABLE 1
MUNICIPAL SOLID WASTE LANDFILL
CLOSURE CONSTRUCTION QUALITY ASSURANCE REQUIREMENTS

ITEM	TESTING	FREQUENCY
BORROW SOURCE	GRAIN SIZE (ASTM D-422)	2000YD ³ <OR=3/4INCH
	MOISTURE CONTENT (ASTM D-2216)	2000YD ³
	ATTERBERG LIMITS (ASTM D-4318)	5000YD ³
	MOISTURE-DENSITY CURVE (ASTM D-698 OR D-1557)	5000YD ³ & all changes in material
	PERMEABILITY (remold) (EM 1110-2-1906, APPENDIX 7, SECTION 1 OR ASTM D-5084)	10000YD ³ <OR=1.0X10 ⁻⁵ CM/SEC
CLAY LAYER DURING CONST.	DRY DENSITY (ASTM D-2922 OR D-1556)	1 TEST/10000 SQ FT/LIFT 1 TEST/LIFT/200 LF OF SIDE SLOPE
	MOISTURE CONTENT (ASTM D-2216)	4 TEST/40000 SQ FT/LIFT
CLAY LAYER LAB TESTING	*PERMEABILITY (ASTM D-5084)	1 TEST/40000 SQ FT/LIFT <OR=1.0X10 ⁻⁵ CM/SEC 1 TEST/LIFT/800 LF OF S.S.
	*DRY DENSITY (ASTM D-2922)	1 TEST/40000 SQ FT/LIFT 1 TEST/LIFT/800 LF OF SIDE SLOPE
	*MOISTURE CONTENT (ASTM D-2216)	1 TEST/40000 SQ FT/LIFT 1 TEST/LIFT/800 LF OF SIDE SLOPE

* TESTS TO BE PERFORMED ON UNDISTURBED SAMPLES