"Design of a State-of-the-art Mechanism to Evaluate the Structural Behavior of Geosynthetic Interfaces in Municipal Landfills"

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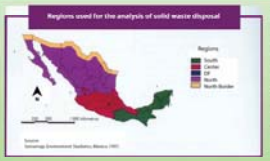
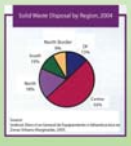
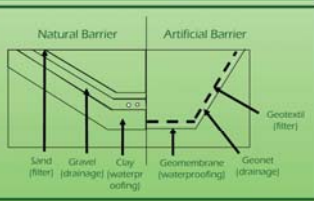


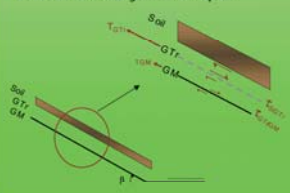
Despite collection and transport of municipal solid waste is a common practice in Latin America, adequate final disposal of solid waste is still a major problem because of the insufficient infrastructure and small number of properly-designed landfills. According to the Secretary of Environment and Natural Resources of Mexico, Mexico generates 34.6 millions of tons of solid waste per year, 0.92 kilograms per capita, and about 33 percent of this total is disposed in uncontrolled sites. The North Border contributes with 9% of the solid waste disposal in Mexico.



From the environmental point of view, landfills are nowadays one of the best solutions for confinement and final disposal of municipal solid waste. Several constituents of the biogas and leachate produced by the degradation of organic waste could be hazardous to the environment. For this reason, landfills must be properly designed to ensure an adequate control, treatment and disposal of both products. In terms of structural and environmental design, it is essential for landfills to ensure waterproofing at bottom and top layers. In practice, this is commonly achieved by using natural and artificial barriers such as clay coverings or multi-layer geosynthetic systems, respectively.



Interface Analysis Principle



The construction of landfills with multi-layer geosynthetic systems demands a correct characterization of the geosynthetic interfaces in order of satisfying the design and purpose of these, that is why traditionally direct shear and pull out tests are completed to determine the interfaces parameters.

Landfill with Artificial Barrier

Pull-out Equipment

Direct Shear Equipment

Prototype of an Inclined Plane

To characterize geosynthetic interfaces some researchers such as Giroud, Girard, Wasti, Palmeira, among others, have used an apparatus named inclined plane.

An Inclined Plane is an apparatus that has, primarily, a plane to which and inclination will be given by a mechanic elevation system, causing the plane an angular displacement.

This equipment is used to test geosynthetic interfaces, and according to the researchers mentioned, its conditions exemplify in a better way the real behavior of a multi-layer system used in a landfill, than the traditional tests, which are really under low confinement pressures.

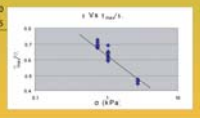
Construction

To assembly the inclined plane, these was divided in the phases shown in the figure to the left.

Render of the Inclined Plan

Calibration and Tests

Esfuerzo Normal σ (kPa)	Ángulo de Fricción interna ϕ	τ/σ
0.7430	33.9949	0.6744
1.0537	32.0464	0.6260
2.7554	24.8693	0.4635



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