



This document provides general installation guidelines for Propex GEOTEX[®] geotextiles in environmental applications including lagoon caps and geomembrane cushions.

LAGOON CAPS

PLACEMENT OF GEOTEXTILE

- Debris within the lagoon, such as glass, roots, metal, and bushes that could catch or damage the reinforcement should be removed.
- Temporarily fill lagoon with water for reinforcement placement. Presence of water on top of the sludge/soil will aid positioning of the reinforcement because polypropylene is lighter.
- Prefabricate the structural reinforcement in one large panel with the machine direction parallel to the longest dimension of the lagoon (See Figure 3B). This ensures that the machine direction is perpendicular to the direction of fill placement.
- The reinforcement should be fabricated using a seaming technique that would leave the entire panel in an accordion fold for deployment at the project site (see Figure 1). The reinforcement panel can be fabricated at a factory or on-site.

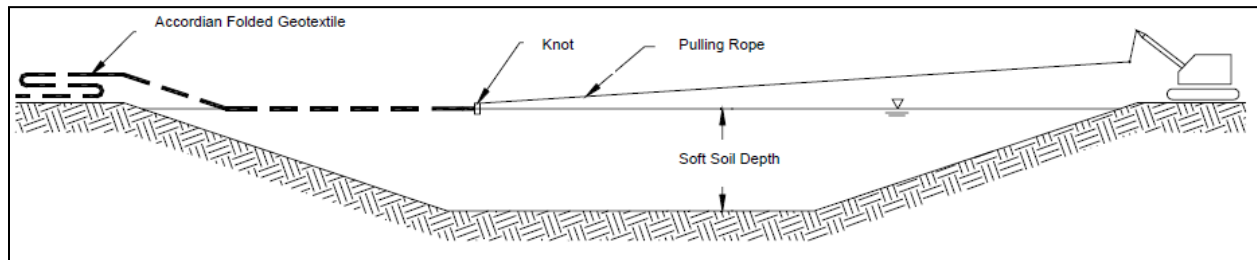


Figure 1: Pulling geotextile across lagoon

- If drainage at the reinforcement-sludge interface is required, drainage pipes can be sewn into the seams to aid in removal of the liquid.
- The reinforcement should be positioned over the lagoon using a pulling rope or cable (See Figure 1). The ropes should be attached to the reinforcement with knots at a sufficient number of locations to minimize stress concentrations from the pulling process. Cables attached to C-clamps can be used to attach the pull rope to the reinforcement. Typically a maximum of 100 ft (30.5 m) spacing is used between the pull points.
- Constant speed of the deployment equipment, with no sudden jerks, is necessary to minimize deployment stresses on the reinforcement. This is particularly important when transitioning between areas of sludge and water. The leading edge of the reinforcement should be hoisted as high as possible to minimize drag on the lagoon's surface.
- If the lagoon is too long to deploy the reinforcement in one pass, the reinforcement can be deployed in two or more passes. This can be accomplished by attaching the deployment equipment to the midpoint of the reinforcement panel, leaving the leading edge of the reinforcement panel in place until the end of the initial pull.
- As reasonably as possible, remove all wrinkles from the reinforcement panel prior to placement of any fill. This is accomplished by tensioning the reinforcement toward the final anchorage location. Winches or deployment equipment attached to the reinforcement can be used to pull the reinforcement taut.

PLACEMENT OF FILL

- Whether naturally present or pumped in, water should be removed from the lagoon prior to fill placement.
- The reinforcement should be fully anchored on at least two opposite sides and sometimes around the entire perimeter of the lagoon prior to placement of any interior fill. As a minimum, sandbags should be used to anchor any reinforcement edge that will not be covered with soil. As part of the anchorage procedure, a sludge lock (See Figure 2), may be incorporated by encroaching slightly (Less than 3 ft) on the soft material prior to covering the remaining anchorage length. This will prevent the soft materials from squeezing out between the reinforcement and fill.
- For conventional fill placement procedures, low ground pressure (LGP) equipment should be used. LPG equipment usually refers to bulldozers with wide tracks that exert less than 5 psi (34.5 kPa) ground pressure.
- The fill should be stockpiled in the anchorage zone and pushed out onto the soft soil in thin lifts (12 inches). The thin lifts are necessary to reduce mud waving; mud waving is considered a problem if the reinforcement in front of fill placement rises above the height of the fill.
- To maximize the benefits of the reinforcement, a placement technique known as “finger fills” (See Figure 3) shall be used to maintain uniform tension in all areas of the reinforcement and to control mud waving.

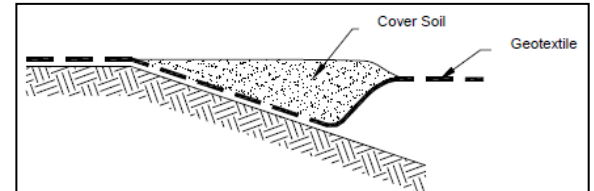


Figure 2: “Sludge Lock” Diagram

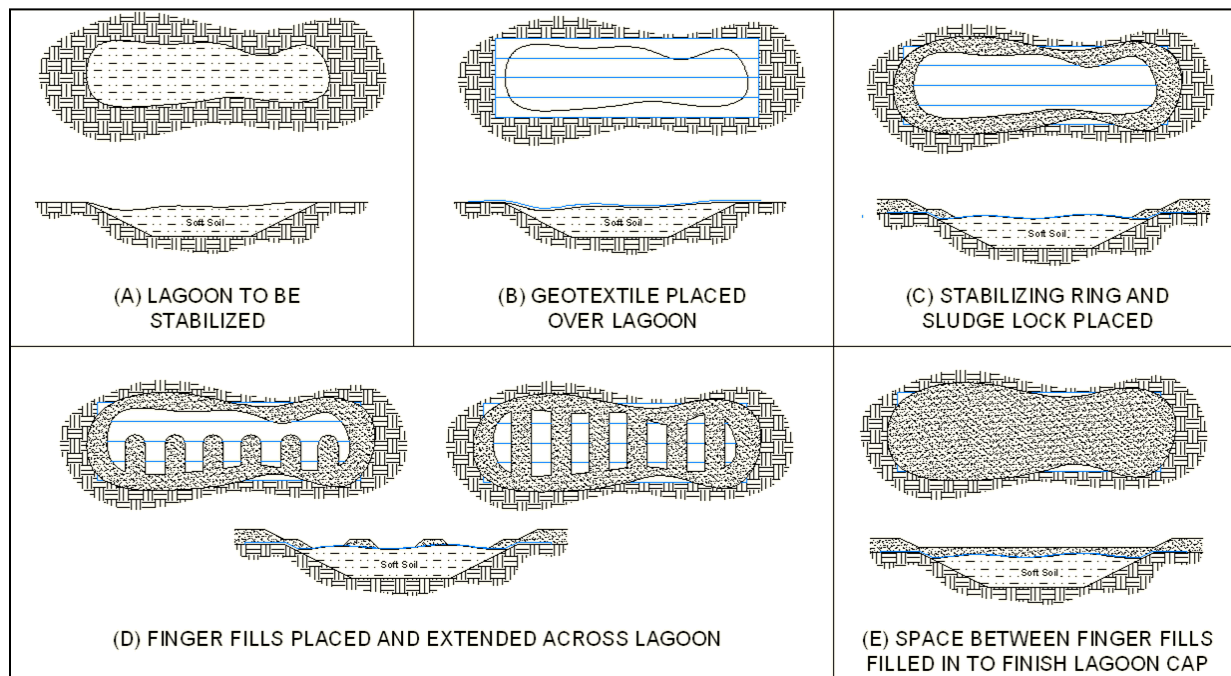


Figure 3: Finger Fill Placement

- A typical finger fill is the width of one crawler dozer pass, with initial spacing between fingers of about two to four dozer widths. Once the first finger fills are completed across the lagoon the second pass

fingers fills can be placed between the initial fingers fills. The first lift is then completed by spreading the fingers to fill the remaining open areas evenly (See Figure 3E).

- The softness of the underlying soils will dictate fill placement procedures for the second lift; however, it is recommended to utilize the finger fill technique for the second lift as well. If using well graded to coarse sand and gravel, general operation of the crawler earthmoving equipment is typically sufficient compactive effort for these first two lifts. For most projects, placement of the third lift can usually be done with conventional earthwork equipment and compaction procedures.
- Sufficient time should be allowed for the soft materials to experience primary consolidation prior to construction of any permanent structure (i.e., geomembrane cap, parking lot) on the soil cap. Determination of the end of primary consolidation can be aided by the use of instrumentation, such as settlement plates and pore pressure transducers. Timely reading and interpretation of these geotechnical instruments is recommended to be performed to provide pertinent data to assess completion of primary consolidation, if the time line for construction of permanent structures above the stabilized soil/sludge is critical.

GEOMEMBRANE LINER CUSHION FOR LANDFILLS

SITE PREPARATION

- The engineer shall verify that the subgrade is ready for geotextile instillation, and that elevations are as indicated on the contract drawing.
- The subgrade shall be fairly smooth and free of sharp objects and debris that may damage the geotextile.

GEOTEXTILE AND GEOMEMBRANE INSTILLATION

- The geotextile should be anchored in place to maintain alignment as it is unrolled. Anchoring can be accomplished by laying sandbags on the back end of the geotextile.
- Unroll geotextile on subgrade while applying tension to minimize wrinkles.
- The Geotextile shall be heat seamed side-to-side and end-to end.
- Once the geotextile cushion has been installed, the geomembrane liner is installed over the bottom geotextile cushion, and another layer of geotextile cushion is installed over the geomembrane following the steps above (See Figure 4).

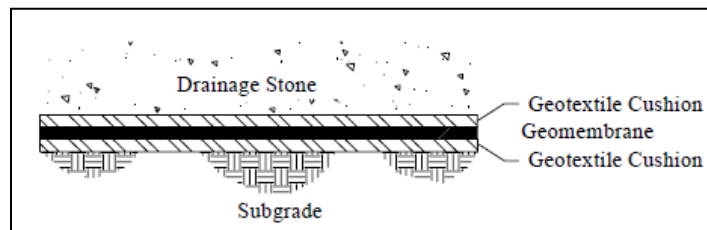


Figure 4: Typical Municipal Landfill System

DRAINAGE STONE INSTILLATION

- Drainage stone is placed over top geotextile cushion (See Figure 3).
- Aggregate can be spread using conventional earthwork practices and equipment.
- Sandbags should be placed on edges of geotextile cushion to prevent movement of the geotextile during spreading of the first aggregate lift.

- The aggregate shall be back-dumped onto the geotextile and spread with a tracked bulldozer. Low ground pressure (LGP) equipment is recommended.
- To minimize wrinkles caused by shoving, aggregate shall be pushed and spread gradually while lifting blade or bucket (See Figure 5). Sharp turns or abrupt stopping should be avoided.

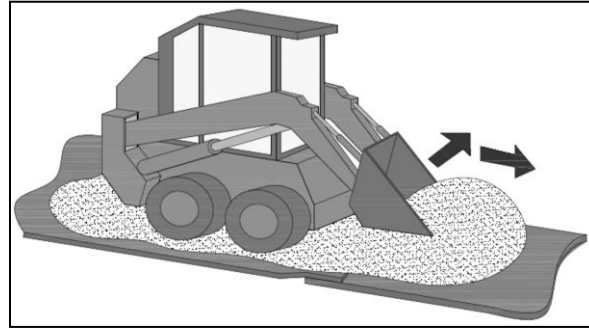


Figure 5: Spreading of Aggregate

GEOMEMBRANE LINER CUSHION FOR LIQUID IMPOUNDMENT

Installation of geotextile cushion for liquid impoundments can follow steps for landfill installation, omitting the installation of a second geotextile layer and drainage stone (see Figure 6).

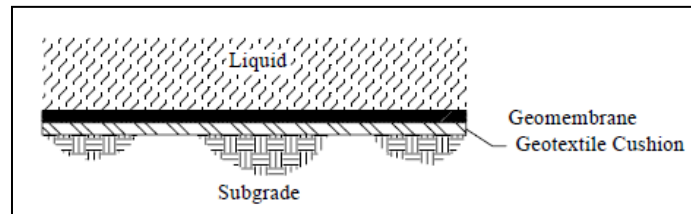


Figure 6: Typical Liquid Impoundment System

GEOMEMBRANE LINER REINFORCEMENT FOR LANDFILL EXPANSION

Steps outlined above for geotextile cushioning of geomembrane liners for new landfills can be followed for reinforcing geomembrane liners used in landfill expansions (See Figure 7).

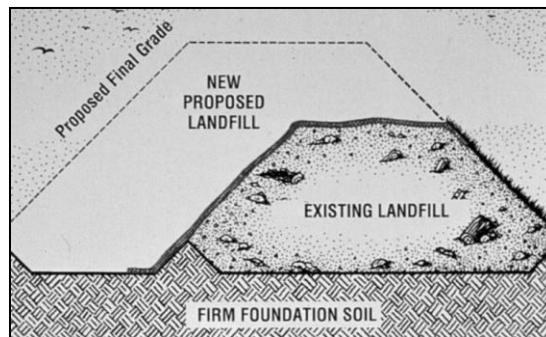


Figure 7: Landfill Expansion