

1. SCOPE

This installation Guideline is valid for all Secugrid® geogrids used as veneer reinforcement in sealing systems of landfill caps. The geogrid is designed to prevent slippage of cover soil or geosynthetic components together with the cover soil especially on steep slopes, where the interface friction between individual components of the sealing system is too low, to provide sufficient stability against sliding. The guideline details the receipt, storage and handling, installation of geogrid and fill placement.

2. RECEIPT, STORAGE AND HANDLING

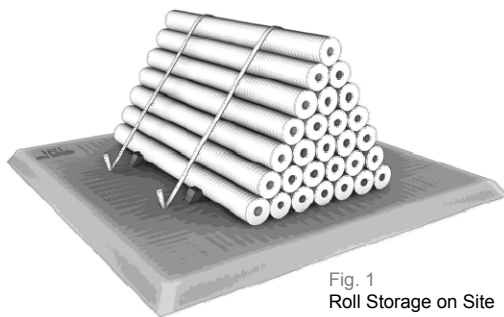


Fig. 1
Roll Storage on Site

Geogrids received shall be verified as being the type, grade or designation required for the project, as defined in the construction drawings and as approved by the project engineer. Material shall be clearly marked and in good condition before acceptance by the contractor. Geogrids are transported and stored in rolls and may be stacked on top of each other, but no more than seven rolls in height. If stored on the ground the soil on

which they are placed must be dry, even and free of foreign matter. A tarpaulin for protection from the elements must cover material stored onsite for a period exceeding two months.

Geogrids may be installed either manually or by mechanized equipment. Edges of the geogrid rolls can be sharp, so gloves may be used during hand carrying and placement to prevent injury. Mechanized equipment may be used providing the said installation equipment does not damage the geogrid during this process.

3. SECUGRID INSTALLATION

The surface on which the geogrid is to be installed should be cleared of all obstacles and shall be smooth and level. Before unrolling the geogrid, verify the roll identification, length and installation location with the construction drawings. While unrolling the geogrid, it should be inspected for damage or defects. Damaged areas of the geogrid shall be cut out over the full width of the roll and shall be excluded

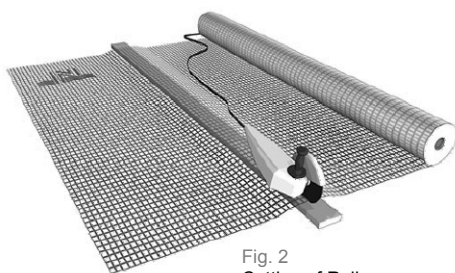


Fig. 2
Cutting of Rolls

from installation. The cutting and cutting to size of Secugrid® geogrid panels to the specified lengths given in the construction drawings can be carried out using an angle grinder whereby it is useful to lay a wooden plank beneath the grid and to carry out the cutting process either on or along the edge of the plank. Secugrid® geogrids up to 40 kN/m strength can be cut using customary cutter knives.

Special attention needs to be paid to the orientation of the geogrid as the strength in transverse direction may vary from the strength in longitudinal direction. Generally the geogrid is placed with its main stress direction (direction with highest tensile strength) installed down the slope starting from the trench/runout area at the slope crest. Dimensions of the anchorage zone shall be carried out in accordance to the design and construction drawings. Alternative anchorage details are shown in the following figures 3 and 4.

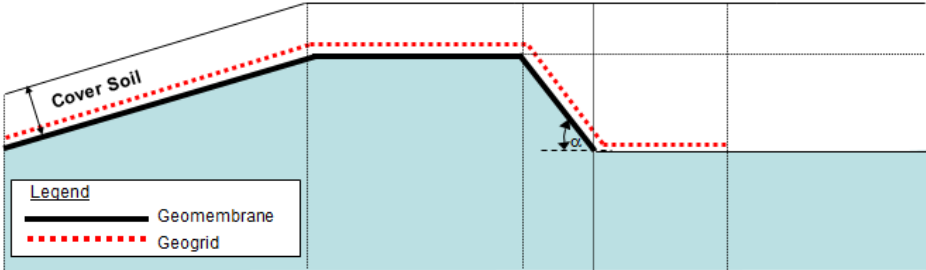


Fig 3: Installation of Geogrid into an anchor trench

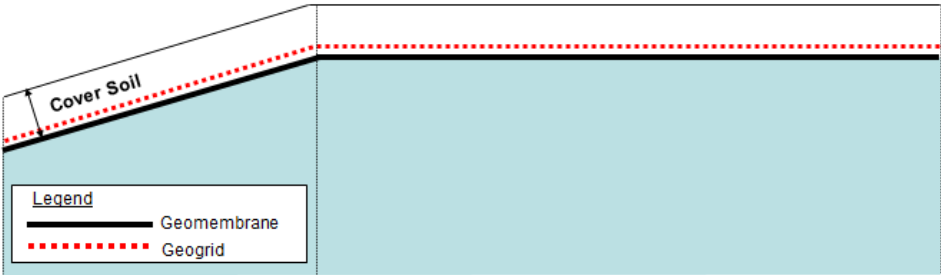


Fig. 4: Horizontal anchorage of Geogrid at transition zone between slope & plateau

In case that the slope is discontinuous (subdivided by intermediate berm sections) the sealing system together with the veneer reinforcement has to be anchored in the berm area per individual slope section. After the geogrid is fixed in the anchorage zone it is rolled down the slope and finally pulled taut so that all wrinkles and folds are removed. Adjacent geogrid panels should be overlapped by min. 300 mm to ensure 100% coverage. Smaller overlaps may be acceptable if panel shifting is prevented by mechanical fasteners, like e.g. cable ties. The geogrid veneer reinforcement should be installed as one continuous panel over the full length of the slope; overlaps in main stress direction are strictly forbidden.

It is essential that the geogrid is installed with its main stress direction being absolutely parallel to the slope line. In curved areas, multiple geogrid overlaps are possible. If this is the case, the number of overlaps should be reduced to maximum 2 and the zone between the geogrid panels should be filled with a thin (approx. 100mm) sandy/gravelly soil layer. If more than 2 overlaps cannot be prevented the installation procedure needs to be coordinated and approved by the designer.

4. FILL PLACEMENT

Placement and distribution of the cover soil / restoration layer shall be carried out in such a way that prevents wrinkles and slippage of the geogrid. The cover soil should be distributed in the direction of the overlap to prevent panel separation. To reduce the risk of creating wrinkles in the geogrid veneer reinforcement during placement of

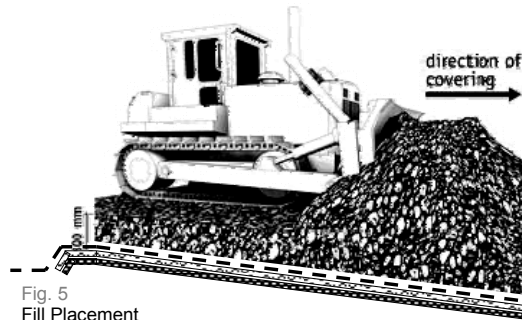


Fig. 5
Fill Placement

fill, the preferred direction of soil placement shall be down the slope. It shall be verified by the responsible project engineer that this non-conventional way of soil placement, which cannot rely on toe buttressing (unsupported soil mass) and must take into consideration additional dynamic stresses from the construction equipment, is covered by the design. The type of construction equipment (generally small dozers with low

ground pressure) used to install the cover soil as well as the first soil layer thickness shall be in line with the scenario covered in the design. Heavier equipment and lower soil layer thicknesses may create inadmissible stresses which do not provide satisfactory safety factors. Direct trafficking of construction equipment on the geogrid is generally strictly forbidden.

A minimum cover of ≥ 300 mm should be maintained between construction equipment and geogrid veneer reinforcement. The contractor is responsible for verifying any construction equipment loading constraints with the project engineer before fill placement. Compaction of the fill shall be in accordance to the project specification. Depending on the slope inclination the installation of an erosion control mat may be recommendable to increase the stability of the cover/restoration soil layer. The internal shear strength of the cover/restoration soil, under consideration of the planned slope inclination, must be assured even under fully saturated conditions.



Figure 1: Anchorage of geogrid in runout area



Figure 2: Anchorage of geogrid in anchor trench



Figure 3: Unrolling geogrid from top to bottom



Figure 4: Pulling geogrid tight



Figure 5: Installation of cover from top to bottom using lightweight dozer



Figure 6: Installation of cover soil with long-boom excavator



Figure 7: Installation of erosion control mat



Figure 8: Vegetation starts growing on cover soil