

Case Study

application 1H:1V Reinforced Perimeter Berm
location Elk River, MN
product Miragrid® 2XT, 5XT, & 7XT

job owner
landfill design engineer
Geosynthetic Design Engineer
contractor

Waste Management
Liesch & Associates, Inc
Gale-Tec Engineering, Inc
Veit Construction

TenCate develops and produces materials that function to increase performance, reduce costs and deliver measurable results by working with our customers to provide advanced solutions.

THE CHALLENGE

Waste Management was required to close a portion of their Elk River Landfill – Phase 16 Cell and provide a final geomembrane cover. In order to reduce the encroachment of the western landfill toe into a buffer area, the Landfill Operator/Owner required a steep 40 ft. high landfill side slope. Gale-Tec Engineering, Inc. (USA) prepared a Value Engineering Change Proposal (VECP) on behalf of the Contractor that lowered the original project cost by effecting a geosynthetic reinforcement 1H:1V landfill side slope without impairing the essential functions and characteristics of the project.

The project involved the construction of a steep 1H:1V landfill western slope as high as 40 ft. above grade plus the slope needed to support a new access roadway at the top of the landfill.

THE DESIGN

A soil reinforcement section characterized by a slope of 1H:1V was identified for the project. Because of both internal and global stability concerns, the 1H:1V slopes were designed and constructed with soil reinforcement.

A limit equilibrium computer program was used to assess stability of circular and wedge failures within the reinforced slope sections. Global failures were designed based on “target” factors of safety of 1.1 - 1.3 for short-term conditions and 1.4 – 1.5 for long-term conditions. The computer analyses performed searches to identify the most critical failure sur-

faces as related to prescribed factors of safety. To give both short-term and long-term stability to the landfill slopes, geosynthetic reinforcing layers were embedded into a newly constructed perimeter berm using granular fill.

THE INSTALLATION

Primary reinforcement was accomplished by installing TenCate Miragrid® 5XT and 7XT at 4 ft. vertical intervals with Miragrid® 2XT installed as secondary geogrid at 1 ft. intervals between these primary reinforcement layers. The primary embedment lengths were as much as 32 ft. at the bottom of the berm and 28 ft. at the top of the berm. In order for the reinforcement to perform as designed, the geogrid lengths needed to lie flat and be taut. In order to achieve this end, the fill was strategically pushed out over the grid panels.

Erosion at the face of the reinforced slope was a concern due to infiltration during rainstorms. Such events could trigger sloughs and slides within the near surface. To enhance performance, 1 ft. of topsoil, an erosion mat wrapped around the face, a MnDOT 50B seed mix with 12-12-12 slow release fertilizer was used.

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