

### CRUSHER WALL IN MARIKANA PLATINUM MINE NORTH WEST PROVINCE, ZA

#### GEOTECHNICAL / REINFORCED SOIL WALLS

**Product:** Terramesh<sup>®</sup> System, Paragrid<sup>®</sup>

##### Problem

Part of the construction of the plant infrastructure at the new Marikana Platinum mine in the North West Province entailed providing access to the 20m high loading bin at the primary crusher.

Constructing an earth retaining structure of this height is already a significant undertaking, yet was further complicated by the specific needs of this project site:

- High vertical and horizontal loads (150kPa and 850kN respectively) imposed by heavy-duty Caterpillar 777 mining dump trucks
- Ongoing dewatering of the mining area which could result in differential settlement
- The presence of a layer of expansive cohesive materials in close proximity to the foundation of the structure

A flexible retaining structure would accommodate these conditions more favourably than a traditional concrete retaining wall.

Dowding Reynard and Associates (DRA), Plant Design and Control Engineers for Aquarius Platinum, approached Maccaferri SA for design assistance.

##### Solution

A 22.5m high vertical Terramesh<sup>®</sup> System wall was proposed due to its inherent flexibility. The design was carried out in-house by Maccaferri's technical department with the assistance of the MacStars 2000<sup>™</sup> software package for soil reinforcement, using recognised international design guidelines.

Terramesh<sup>®</sup> is used to construct reinforced soil structures. A unit consists of a continuous horizontal panel of woven steel-wire mesh geogrid with an integral gabion fascia unit. This makes the system efficient and economic to construct as there is no complex connection to be made between the grid and the facing unit. Installation is quicker and there is less potential risk of errors and omissions during construction. This is particularly important in these high-load structures, where the connection between reinforcing geogrid and fascia unit is important.

Client:

AQUARIUS PLATINUM

Main contractor:

GRINAKE-LTA

Designer:

DOWDING REYNARD & ASSOCIATES

Products used:

TERRAMESH SYSTEM<sup>®</sup>, PARAGRID<sup>®</sup>

Date of construction

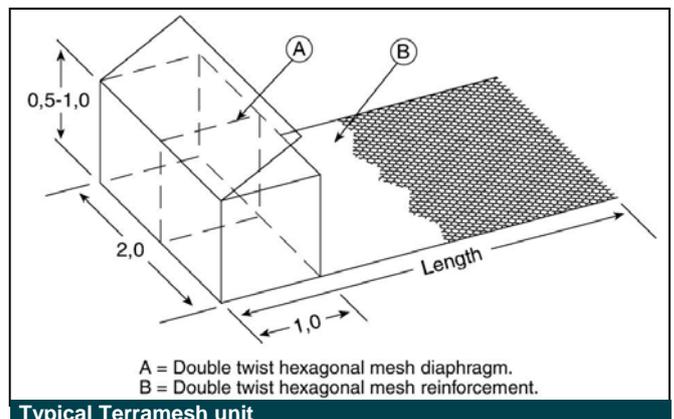
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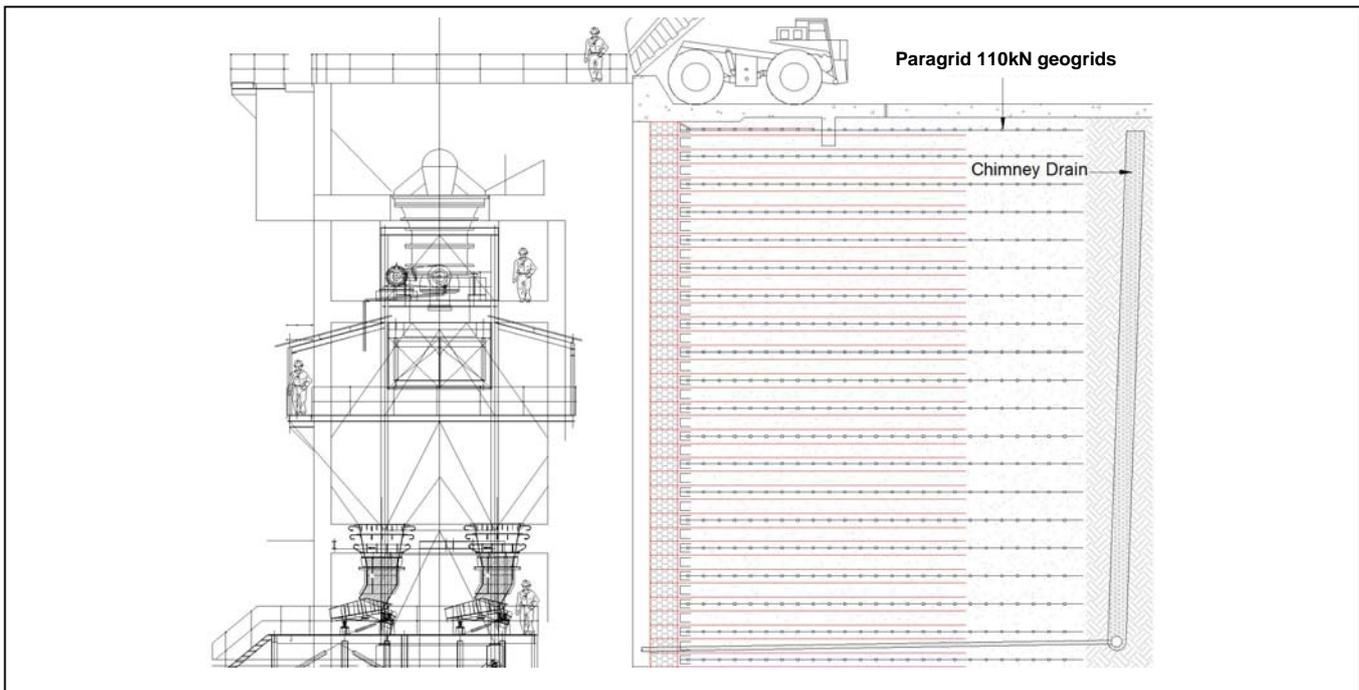
During construction



Structure nearing full height



Typical Terramesh unit



Typical cross section of Terramesh wall at 22m high section

The fascia unit is filled with hard durable rock-fill in the same manner as a gabion and the geogrid tail is then sandwiched between layers of compacted structural backfill. Wherever possible, Maccaferri attempts to reuse site-won material as structural backfill to these Terramesh® reinforced soil structures.

The entire wall was founded on a 1m thick rock layer. Pre-approved selected soil was used for the structural backfill to the geogrid units which was compacted. On-site material was used as structural backfill, dramatically reducing the cost and pollution associated with importing structural materials. Earthworks quality control on site was strictly monitored.

At the most critical section of the wall, reinforcement was provided every 0.5m in the form of 0.5m high Terramesh® units. Additional polymer reinforcement, Paragrid® with ultimate tensile strength of 110kN/m, was installed every 1.0m vertical spacing. The reinforcement length behind the wall was approximately 15m.

Groundwater management within reinforced soil structures is important. To collect groundwater, a chimney drain was installed behind the reinforced zone with outlets provided through to the front face.

Once completed, this was the tallest Terramesh® wall in Africa with a face area of 1880m<sup>2</sup>. Wing walls on each side of the headwall, tapered down at a slope of 1:2 over an overall length of 132m.

## Benefits

- The modular Terramesh® System units were manufactured with the designed reinforcement length before delivery to site, enabling quick and easy installation by the contractor.
- The inherent flexibility of the Terramesh® System allows for settlement and consolidation without excessive deformation to the reinforced soil wall structure and loss of function. Expected settlement during the life of structure is around 300mm.
- On-site soil materials were used for the structural backfill, reducing the overall cost of the project.
- Trainers were made available to assist the contractor in achieving a high standard of rock packing within the fascia units and impart the necessary skills to the labourers.
- The project generated much needed employment. Eighty locally sourced labourers were used within the works, contributing financially to the local economy of the area.

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