

NEW AIRPORT IN MOUNTAINOUS REGION
SHENNONGJIA, HUBEI PROVINCE, CHINA

RETAINING WALLS & SOIL REINFORCEMENT

Product: Terramesh® , MacGrid® WG

Problem

A new airport was determined to support the initiative to try and unlock tourism and growth in the region. Already a tourist destination, the Shennongjia Nature Reserves are nearby in this highly forested area; UNESCO added Shennongjia to its World Network of Biosphere reserves in 1990.

Although construction of any infrastructure in these unspoilt areas is controversial, the overall goal is attracting tourists and improving the local economy in this western area of Hubei Province.

Compounding the construction of any infrastructure is that the project site is located high in the mountains (+2,580m above sea level) and would be the highest airport in China outside of the Tibetan plateau.

The construction of the flat runway plateau within this mountainous area would require the cut-and-fill of the steep slopes. Retaining structures of over 40m high would be required to minimise the footprint of the construction works. Furthermore, the reforestation and environmental restoration works were an important part of the project.

Solution

The cut-and-fill operations would enable the insertion of the 2,800m runway and airport buildings. To stabilise and reinforce the 'fill' (valley) side of the project, soil reinforcement offered the most effective solution:

- Use of the 'cut' waste material as structural backfill within the soil reinforcement 'fill' walls would minimise the export/import of construction materials
- It would minimise the footprint / land-take of the solution compared to traditional earthworks
- It would be more cost-effective and with a lower carbon footprint than comparable height traditional retaining structures
- It would be a flexible system able to accommodate differential settlements and removes the need for a rigid foundation structure

Maccaferri were approached to assist in the design and supply of the reinforced soil slope on account of their deep experience in these very tall mega-structures.

Client:

SHENNONGJIA AIRPORT CONSTRUCTION PROJECT HQ

Main contractor:

BEIJING JINGOLD AIRPORT CONSTRUCTION CO. LTD.

Designer:

SHANGHAI NEW ERA CIVIL AVIATION AIRPORT DESIGN & RESEARCH INSTITUTE CO. LTD.

Products used:

TERRAMESH® SYSTEM, MACGRID® WG

Date of construction

2011-2013



Preparing the foundation to the Terramesh wall



Terramesh gabion fascia units - optional temporary formwork



Schematic of Terramesh and MacGrid WG primary geogrids



Completed Terramesh structure supporting runway

Terramesh® and MacGrid® WG were determined to offer the optimum solution. The reinforced soil wall reached nearly 50m high.

In this project, the Terramesh® System was supplemented with MacGrid® WG geogrids as the primary soil reinforcement to form a hybrid reinforced soil structure.

Terramesh consists of a modular gabion fascia element, with an integral steel wire woven mesh geogrid tail. The geogrid is sandwiched between layers of compacted backfill, reinforcing it. This enables the soils to stand steeper, accommodate greater loads and settle less than an unreinforced soil.

On this project, the Terramesh® units provided secondary soil reinforcement only. Primary soil reinforcement was provided by MacGrid® WG geogrids. MacGrid® WG geogrids comprise polyester fibres encased within a polymer sheathing for protection.

A benefit of the Terramesh® System is that it forms an ideal environment for climbing and other plant species to thrive amongst the voids in the stone fill. The structure is expected to be covered in vegetation reducing the environmental impact still further.

The speed of construction of the Terramesh® reinforced soil wall was a further advantage of the system and it enabled a reduction in the project program compared to traditional solutions.

The Shennongjia-Hongping airport opened in May 2014.



Reinforced soil wall under construction



Structure at full height

Officine Maccaferri S.p.A. Global Headquarters

Via JF Kennedy 10, 40069 Zola Predosa (BO) - Italy

T: (+39) 051 6436000 F: (+39) 051 643 6201

E: info@hq.maccaferri.com

www.maccaferri.com

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