

# TAXIWAY REHABILITATION AT IVATO AIRPORT MADAGASCAR

## GROUND STABILIZATION AND ASPHALT REINFORCEMENT

**Product:** MacTex® W1 4S / MacGrid® AR 10.7

### Problem

Engineers are continually faced with maintaining and developing pavement infrastructure with limited financial resources. Traditional pavement design and construction practices require high quality materials to fulfil construction standards. In many areas of the world, quality materials are unavailable or in short supply. Due to these constraints, engineers are often forced to seek alternative designs using lower quality materials, commercial construction aids, and innovative design practices.

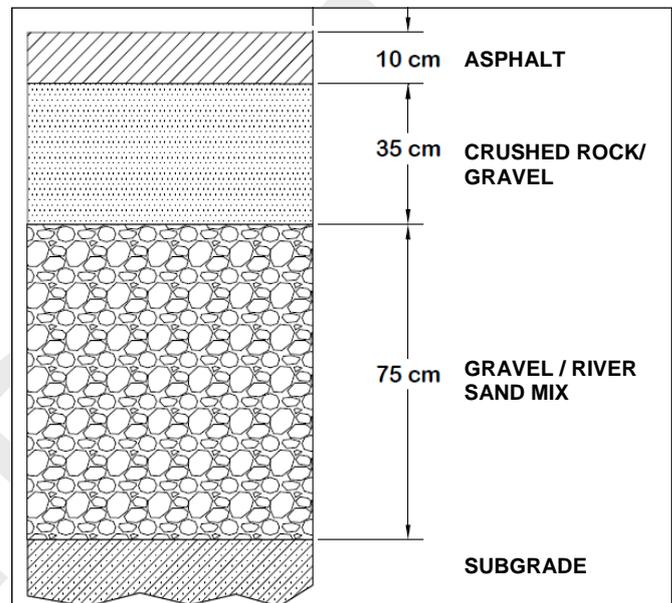
In 2008 at IVATO Airport in Madagascar, Maccaferri Southern Africa was approached to recommend a cost effective solution to rehabilitate sections of the Taxiway and Parking Areas, without compromising on the structural requirements.

The originally design for the pavement structure required an overall construction thickness of 1200 mm consisting of 100mm hot mix asphalt wearing course, a 350mm base course of untreated crushed rock gravel (GCNT 0/40) and a 750mm thick sub-base consisting of a mixture of the gravel in the base course and river sand.

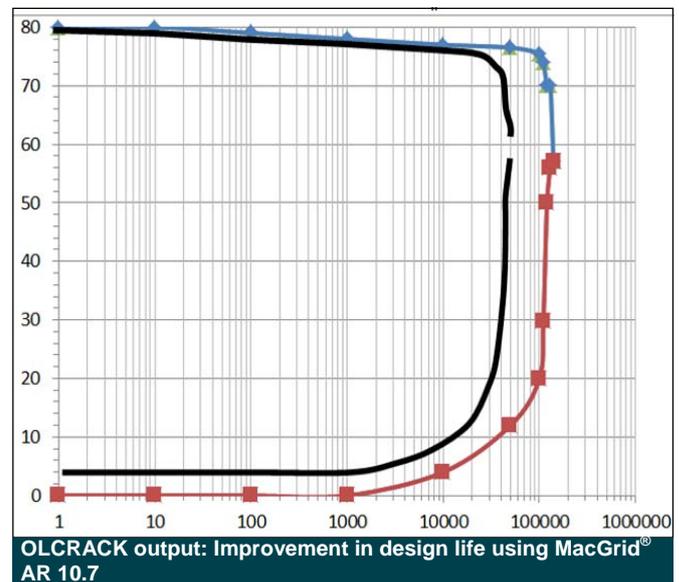
### Solution

The use of geosynthetic materials is proven to be successful in the pavement layers to strengthen the structure, reduce rutting and reduce the construction thickness. Maccaferri proposed the use of specific geogrids and geotextiles within the pavement structure to perform two functions, separation and reinforcement. The solution reduced the thickness of the construction and offered a 17% saving in cost .

The woven geotextile MacTex® W1 4S (40/40 kN/m) was proposed to providing additional reinforcement and a separation layer to limit the contamination of the quality base course with fines migrating from the subgrade and sub-base. This resulted in a 22% reduction in the required thickness of the unbound base and sub-base layers for the same design life as



The original design of the pavement structure



demonstrated by Giroud and Noiray and Sellmeijer.

The asphalt wearing course was also reinforced using MacGrid® AR 10.7; a geogrid made of glass fibre with very high mechanical properties, a tensile strength of 100x100kN/m and elongation at rupture of less than 4%.

The design of reinforced pavements is an empirical mechanistic process and is based on research at the University of Nottingham and investigated crack propagation in reinforced and unreinforced asphalt in four point bending under simulated traffic and thermal

Client:

AVIATION CIVILE DE MADAGASCAR/ADEMA

Main contractor:

DAIHO CORPORATION/SOGEA SATOM

Consultant:

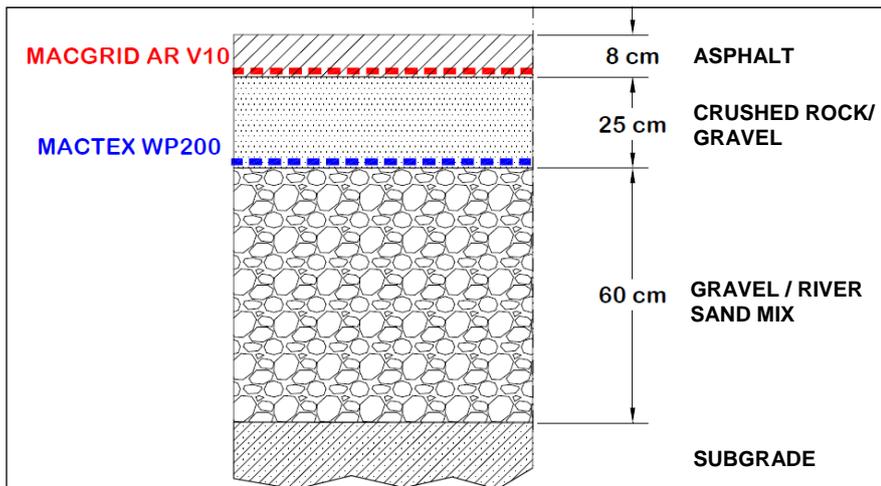
LNTPB (Laboratoire Nationale des Travaux Publics)

Products used:

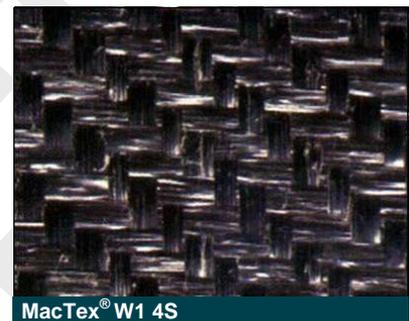
MACGRID AR 10.7 MACTEX W1 4S

Date of construction:

AUGUST 2008 - JUNE 2009



Final design with geosynthetic reinforced pavement and reduced thickness



loading. This research resulted in a design software for reinforced overlays (OLCRACK) which is now used by Maccaferri's professional team.

On this project, the results of the crack reflection analysis of the reinforced overlay using the OLCRACK program show the equivalence in terms of design life between the original unreinforced asphalt layer (100 mm thickness) and the reinforced one (80 mm thickness with MacGrid® AR 10.7).

MacGrid® AR is a geocomposite manufactured from glass fibres woven into a grid configuration, with a polymeric protective coating grid. It offers high tensile strength and high modulus of elasticity at low elongation. Stress concentrations in the asphalt matrix are relieved and redistributed by the reinforcement, delaying the initiation of the cracks.

The MacGrid® AR is unrolled onto the prepared surface and the 80mm asphalt overlay was then placed as normal onto it.

MacGrid® AR is mostly used in resurfacing projects where clients want to limit reflective cracking because of its cost effectiveness and ease of installation.

Maccaferri offers a full range of products for asphalt and unbound pavements, as well as drainage geocomposites to remove water from the pavement structure.

The use of Maccaferri geosynthetics, to reinforce both the subgrade and the asphalt wearing course, enabled the client to reduce the thickness of the pavement construction by 22%. This not only saved the costs and time of installation, it also reduced the amount of quarrying of natural materials and pollution due to transportation of these materials to the project site.





Placing of the asphalt onto the MacGrid® AR 10.7



Completed section



Final result