MACCAFERRI

CASE HISTORY

CH/INT/PH/RWSR037 - Rev: 01, Sep16

SYCAMORE HEIGHTS SLOPE PROTECTION

TAGAYTAY MIDLANDS, CAVITE, PHILIPPINES

RETAINING WALLS & SOIL REINFORCEMENT

Product: MacGrid®, MacTex®, MacDrain®

Problem

One of the recent developments in Tagaytay Midlands involves construction of the Sycamore Heights, an Asian contemporary themed community fronting the famous Taal Lake in Cavite, Philippines. The development was divided in several phases. The first phase of the development required a 420m-long slope protection system along its boundary line which is directly adjacent to an existing creek. The slope to be protected has varying heights from 5m to about 20m, where the major access road of the project is located.

Solution

In close coordination with the project consultant, TCGI Engineers, and the owner Belle Corporation, Maccaferri assisted in the design of a slope protection system that would offer economy as well as technical performance.

A soil reinforced slope (mechanically stabilised earth) using Maccaferri MacGrid® geogrids as soil reinforcement were evaluated and proposed to the client. A wrap-around fascia system would provide the necessary economy. At the foot of the slope, where storm water run-off would need management, Maccaferri gabions and Reno Mattresses were proposed.

The proposal met the Owner's requirements including budget and was duly selected for construction.

Aside from its ease of construction and being a cost-effective alternative to other retaining systems, another distinct advantage of using Maccaferri geogrids is their flexibility to accommodate complex slope geometry requirements. Furthermore, the slope face is designed to vegetate, enabling it to blend into the existing scenery.

In wrapped-face reinforced soil slopes, the MacGrid® geogrids are placed horizontally into position and structural backfill is placed and compacted upon them. The face of the slope is held in place by a temporary support and the geogrid is wrapped back around the layers of compacted fill, enveloping it. In this project, topsoil contained in soil bags were placed immediately behind the geogrid fascia to enable vegetation to establish on the slope face.

During construction of water control structures, January 2014

During construction of reinforced soil slopes, January 2014

Client:

BELLE CORPORATION

Main contractor:

M.B. MALIGAYA CONSTRUCTION

Designer:

TCGI ENGINEERS

Products used:

MACGRID®, MACTEX®, MACDRAIN®, GABIONS, RENO MATTRESS®

Date of construction

Nov 2013 - Sept 2014

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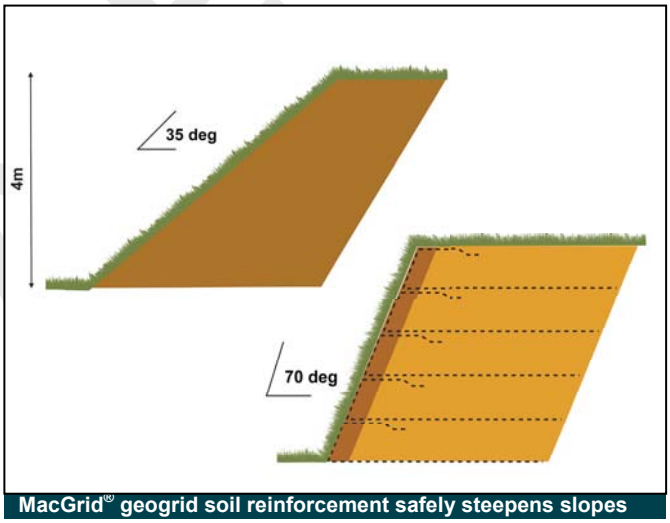
During construction, March 2014

Subsequent layers of MacGrid® are placed consecutively, and backfill compacted to increase the height of the structure. Maccaferri MacGrids are high quality polyester geogrids with a polymeric protective coating providing good long-term performance.

In common with other retaining wall solutions, reinforced soil structures require consideration of storm and ground water management. This is to prevent the structural backfill becoming saturated and weakening.

MacDrain® chimney and subsoil drains were included within the structural backfill. These drainage geocomposites feature a 3-dimensional monofilament matrix, sandwiched between two polypropylene filtering geotextiles. The geotextiles prevent fine soil material from clogging the 3d drainage matrix.

These connected into the site stormwater management system, which in this case included gabion and Reno Mattress hydraulic control structures.



MacGrid® geogrid soil reinforcement safely steepens slopes

Structure nearing completion, August 2014

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MACCAFERRI

CASE HISTORY

Ref: ID / CH / RWSR01 - Rev: 01, Jan 2016

CRUSHER WALL AT INDOCEMENT FACTORY

JAKARTA, INDONESIA

REINFORCED SOIL WALL

Product: Terramesh System, MacGrid WG, MacTex MXL

Problem

Indocement factory is located in the South of Jakarta and it is the second largest cement producers in Indonesia.

The Client needed a flexible retaining structure to be connected with the existing concrete vertical wall used as crusher wall. The total soil height to be retained was approximately 14m. The area is characterized by a high seismicity level and an horizontal seismic acceleration equal to 0.23g had to be considered in the design process. Another constraint of the project was the maximum available space behind the new retaining structure which was equal to 13m.
The client took into consideration in the first place a mass gravity retaining wall made with gabions.

Solution

After a comparison in terms of cost and construction timing, the Client opted for the construction of an Hybrid Reinforced Soil Wall combining metal reinforcements to ensure the facing stability (**Terramesh System**) and polymeric grids as primary reinforcing elements to ensure the global and the internal stability of the wall (**MacGrid WG**).

Terramesh System is a modular system used for soil reinforcement made of pre-assembled units fabricated with double twisted wire mesh 8x10 made of Galfan (Zn-Al5% alloy) and PVC coated steel wire.
The units are provided during the manufacturing process with a double twisted metallic tail (secondary reinforcement).

MacGrid WG is a Woven planar geogrid manufactured from high tenacity PET yarns coated with PVC in order to maximase its durability. The geogrid grade used was equal to **150kN/m**.

The vertical spacing of the geogrids as well as their length have been calculated using the Maccaferri Limit Equilibrium Method in-house software (MacStars W 4.0). Both static and seismic analysis have been performed, checking global stability, internal stability and stability as retaining wall (sliding, overturning and bearing capacity).
The construction of the wall took approximately 2 months.

Client:

PT INDOCEMENT

Designer:

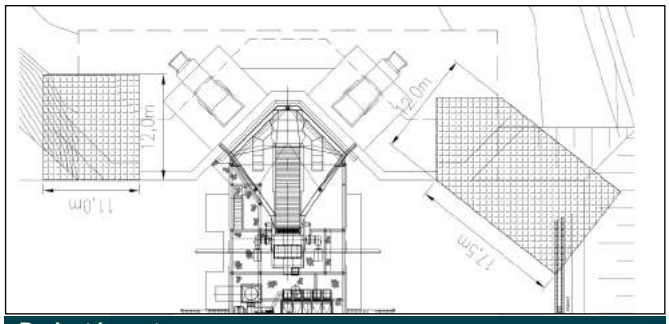
PT INDECO PRIMA / PT MACCAFERRI INDONESIA

Products used:

TERRAMESH SYSTEM, MACGRID WG 15, MACTEX

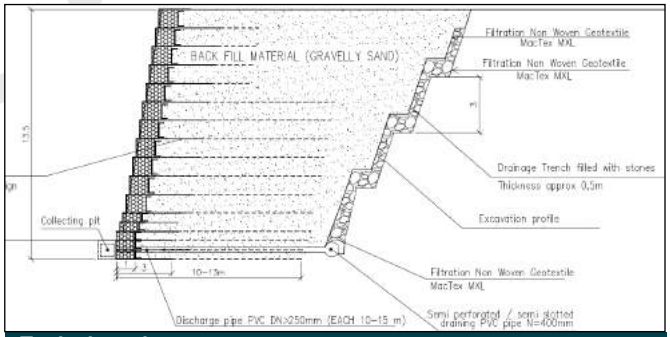
Date of construction

MAY 2015 — JUN 2015

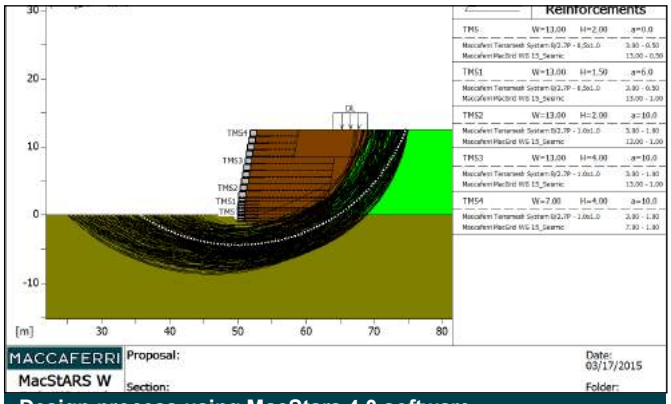


Project layout

Site condition before the construction



Typical section



Design process using MacStars 4.0 software

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Installation of the filtering geotextile for the drainage system

Stones as draining material; Corrugated collecting pipes

Terramesh System installation

Compacting operations

Laying MacGrid WG 15

Backfilling with granular material

Wall after completion

Wall after completion

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Maccaferri operates under strict quality assurance and management procedures. Please visit the website of your Icoal subsidiary for details of their Certifications.

MACCAFERRI

CASE HISTORY

Rev: 00, Issue Data 05.11.2008

SOUTHERN TRANSPORT DEVELOPMENT PROJECT

SEETHAWAKA INSDURIAL PARK, AVISSAWELLA, SRI LANKA

ENVIRONMENTAL/ GEOTECHNICAL ENGINEERING/ BASAL REINFORCEMENT

Product: MacGrid

Problem

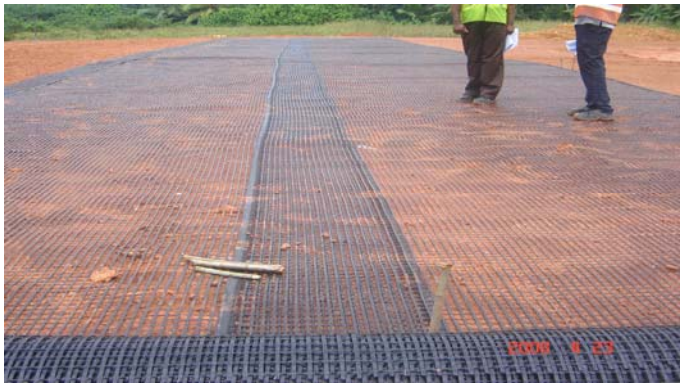
Southern Transport Development Project (STDP) is Sri Lanka's first major expressway project with a length of 126km stretching from Colombo to Matara. Part of the project at section JBIC from Dodangoda to Kurundugahahetekma which is under the care of Taisei Corporation, one of the leading construction company from Japan requires construction of embankment over soft foundation soil for a construction period of 130 days. The height of the embakmnet varies from 4m to 10.5m. Soil investigation further shows that the embankment is to be constructed in an acidic environment. Preliminary design analysis shows that the foundation soil could not support the embankment without treatment at the base of the embankment.

Solution

Maccaferri proposed MacGrid WG 15 and WG 20, a high strength geogrid with a tensile strength of 150kN/m2 and 200kN/m2 respectively. The geogrid is made from high moleculer weight, high tenacity polyester multifilament yarns. The yarns are protected with a polimeric coating making it suitable for acidic soil. The client accepted MacGrid based on the following criteria:

1.0 Low Creep with High Long Terrm Design Strength
2.0 Low Installation Reduction Factor
3.0 Low Durability Reduction Factor
4.0 High Short term Stress Strain Characterictic
5.0 High Pollout Resisitance
6.0 Guaranteed Product Quality

Before construction Date: Aug 2007



During construction Date: Apr 2008

During construction Date: May 2008

Client name:

ROAD DEVELOPMENT AUTHORITY SRI LANKA

Main contractor name:

TAISEI CORPORATION, JAPAN

Consultant:

PACIFIC CONSULTANTS INTERNATIONAL, JAPAN

Product used:

382,069 SQUARE METER - WG 20
238,772 SQUARE METER - WG 15

Construction info

Construction date:	APRIL 2008
Construction end:	PRESENT

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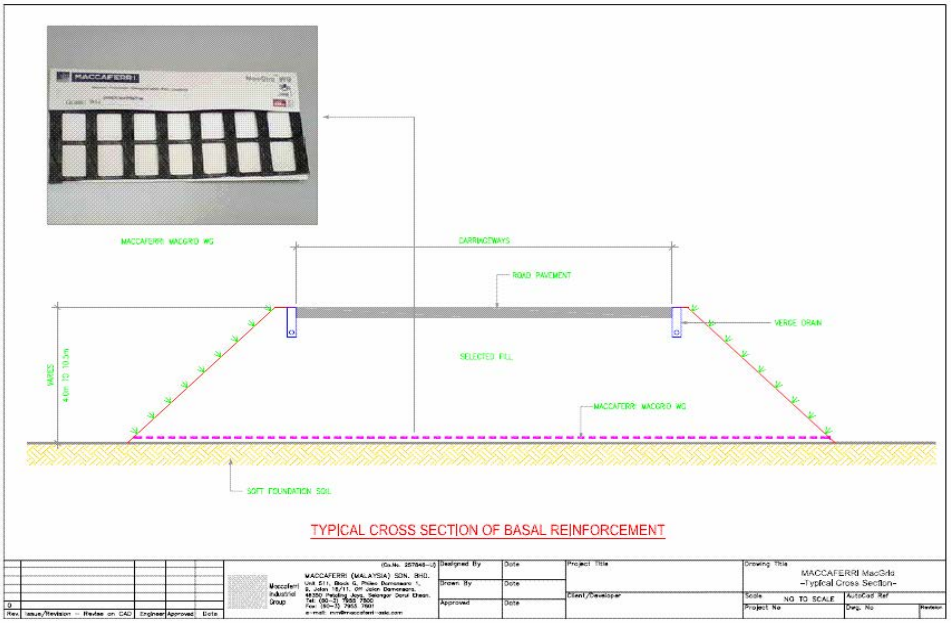

Project section

Date: Feb 2001

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MACCAFERRI

CASE HISTORY

Ref: MM039 — Rev:00, March 2012

REINFORCED SOIL SLOPE

BUKIT GENTING, MARAN, PAHANG, MALAYSIA

GEOTECHNICAL ENGINEERING

Product: GREEN TERRAMESH, MACGRID & MACTEX NON WOVEN GEOTEXTILE

Problem

The FT002 Route is a federal road which connecting Kuala Lumpur to Maran, Pahang. An underground water pipe burst at Section 262, Bukit Genting and it caused a huge slope failure where the existing road collapsed. An emergency work repairing the damaged road needed to be done quickly so to avoid further interruption to the traffic.

Solution

Green Terramesh had been chosen by the consultant due to its suitability to site condition and its greenery fascia which blend it very well with the existing environment.

Maccaferri had designed Green Terramesh combined with MacGrid WG15 as reinforcement for the reinforced soil slope. The height of the proposed reinforced soil slope was 9.6m and the length was approximately 80m. Granular fill was used for the system to prevent build up of pore water pressure. The rehabilitation works completed in a duration of 3 months and the client was satisfied with the fast completion.

Before construction

During construction

After construction

Client:

JABATAN KERJA RAYA PAHANG (JKR)

Main contractor:

ZAHIM SDN. BHD.

Designer:

SZY CONSULTANTS SDN. BHD.

Products used:

GTM4763, MacGrid WG15 & MacTex MXS50

Date of construction:

AUGUST - NOVEMBER 2008

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MACCAFERRI

CASE HISTORY

Ref: MM038 — Rev:00, July 2010

SLOPE STABILIZATION & PROTECTION

BENTONG INDUSTRIAL AREA, PAHANG, MALAYSIA

GEOTECHNICAL ENGINEERING

Product: GEOGRID

Problem

The construction of a new paper factory for CHH Pacific Paper Sdn Bhd is located at Bentong Industrial Area. The construction of the factory will involve few main components such as waste water treatment, guard house, boiler house and access road.

Based on the approved construction drawing plan, the proposed road is very near to the building area (boiler house and guard house).

The proposed wall area was 115m length with approximately 6m height all the way.

Solution

L&W Concrete Works Sdn Bhd has been appointed by CHH Pacific Paper Sdn Bhd to carry out design, supply and construct vertical segmental wall. With technical assistance from Maccaferri, the contractor has completed one design proposal; the combination of segmental block and MacGrid to submit to the client. Two different types of MacGrid were proposed, namely WG4 & WG6 with strength of 40 kN/m and 60 kN/m respectively.

Once the proposal was accepted by the client, construction started in mid June 2009. The construction of the wall took almost 3 months to complete.

As a service oriented company, Maccaferri's staff has visited site to ensure the installation and construction of the MacGrid is correct as per design.

Before construction

During construction

After construction

Client:

CHH PACIFIC PAPER SDN BHD

Main contractor:

L&W CONCRETE WORKS SDN BHD

Products used:

MACGRID WG4 & WG6

Date of construction:

JUNE - AUGUST 2009

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MACCAFERRI

CASE HISTORY

Ref: MM056 - Rev 00, May 2014

GABION, MACGRID™, MACTEX™

IRON ORE MINING, TELUK RUBIAH, LUMUT, PERAK , MALAYSIA

GEOTECHNICAL ENGINEERING

Product: GABION, MACGRID™, MACTEX™

Problem

Vale Malaysia Minerals Sdn. Bhd. is a Brazillian pioneering mining company that provides raw material for coins, cars and computers manufacturing. Due to their expansion, Vale is setting up a new regional iron ore distribution centre and pellet plant located in Lumut, Perak. This centre is scheduled to operate in 2014. It is designed to handle 90 MTPA (Million Tons Per Annum) of Brazillian iron ore and will include port facilities to load and unload ore and pellets, stockyards and pelletizing complex.

An access road was needed to transport materials between the stockyard areas. The pellet plant in Teluk Rubiah is located at hilly terrain and adjacent to the coast of Straits of Malacca. Due to its geological condition, it is very hard to achieve the design's finishing level through cutting and filling. Therefore, a reinforced earth wall was determined to be the best solution.

During construction

Solution

Essar Engineering Services Division is the consultant in designing the reinforced earth wall. The maximum retained height of the wall is 13 meter, whereby the length is 358 meter. The access road will be put to constant pounding from transporting the heavy iron load. Therefore, the reinforced wall will not only have to be functional, but strong enough to withstand heavy loading. The design used a combination of Gabion wall and MacGrid™ geogrid for reinforcement. The geogrid tensile strength used were 200kN/m and 300 kN/m, with vertical spacing at 0.5m. During construction, Maccaferri provided site and technical assistance to the consultant and contractor, to ensure proper installation.

View of reinforced earth wall

After construction

Client:

VALE MALAYSIA MINERALS SDN. BHD.

Main contractor:

WCT BERHAD

Designer:

ESSAR ENGINEERING SERVICES DIVISION

Products used:

GABION, MACGRID™, MACTEX™

Date of construction

OCTOBER 2012 - MAY 2013

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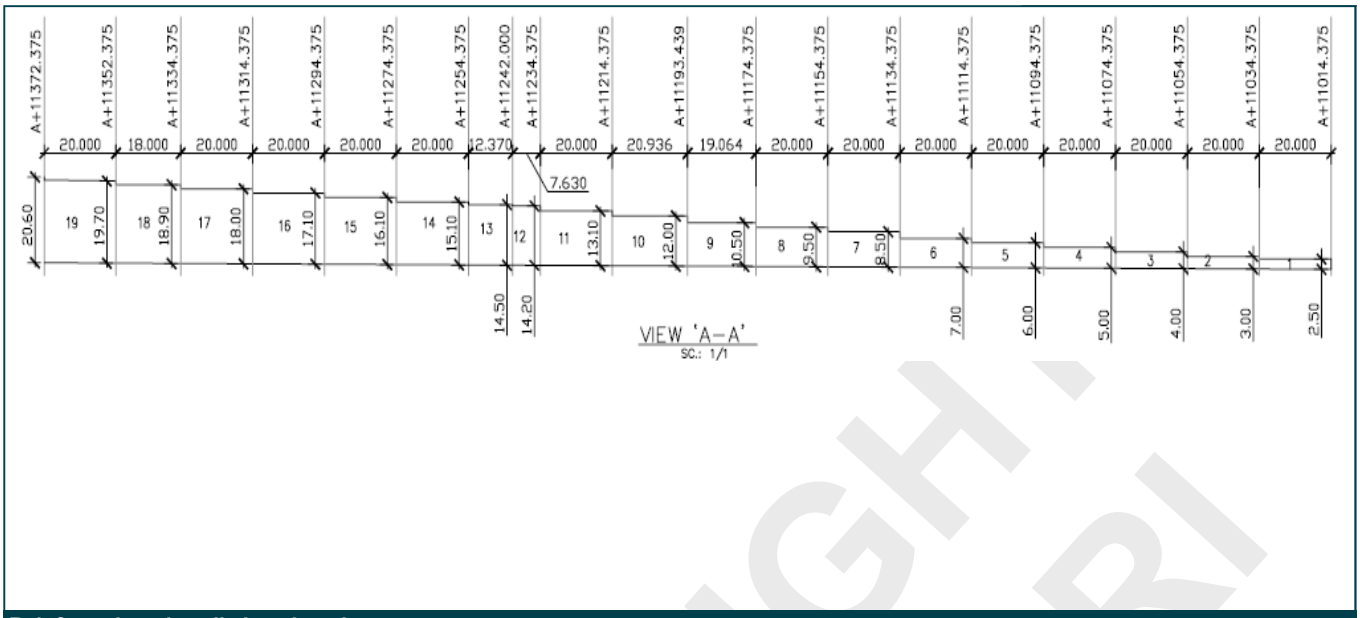
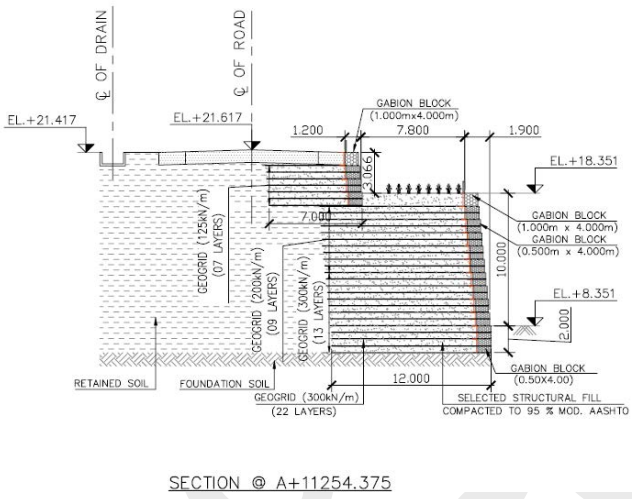


Reinforced earth wall elevation view

Date: March 2013



SECTION @ A+11254.375

Installation of MacGrid™ at site

Filling Gabion boxes with stones

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Bureau Veritas Certified Quality System Company with ACCREDIA and UKAS accreditation

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CASE HISTORY

Ref: MM057 - Rev 00, May 2014

TERRAMESH® SYSTEM, MACGRID™, MACTEX™

PENJOM GOLD MINES, KUALA LIPIS, PAHANG , MALAYSIA

MECHANICAL STABILISED EARTH WALL

Product: TERRAMESH® SYSTEM, MACGRID™, MACTEX™

Problem

Penjom Gold Mines is the largest mine in Malaysia. It is own by PT J.Resources Gold (UK) Ltd. The mine is located in Kuala Lipis District, Pahang; approximately 120km from the Kuala Lumpur city center.

The expansion of the gold mining required a retaining wall to match the height of the proposed crushing plant of 13.5m. Hence, the client was looking for an economical, practical and permeable wall system to be constructed which can utilise the existing site material as a backfill material.

Before construction

Solution

With vast experience in mechanical stabilised earth wall system in Malaysia, Maccaferri has been invited to submit a proposal using the Terramesh® / MacGrid™ wall system. After evaluating the proposal, client agreed to adopt the system due to the following reasons:-

1) Economical - the system can utilise rocks from the site for the Terramesh® System wall, hence reduction in construction cost is significant.
2) Practical - Skilled workers are not necessary to construct the wall.
3) Permeable - the facial of the system consists of rock, which is permeable material.
4) No excessive treatment required for the foundation due to flexibility of the wall system. Hence it will reduce total cost of construction.

The proposed wall is 78m length with 13.5m height maximum at the centre of the wall. The construction of the Terramesh® System wall was started in September 2012 and completed in January 2013.

During construction

After construction

Client:

PT J.RESOURCES GOLD (UK) LTD

Main contractor:

RESINDO SDN. BHD.

Designer:

RESINDO SDN. BHD.

Products used:

TERRAMESH® SYSTEM, MACGRID™, MACTEX™

Date of construction

SEPTEMBER 2012—JANUARY 2013

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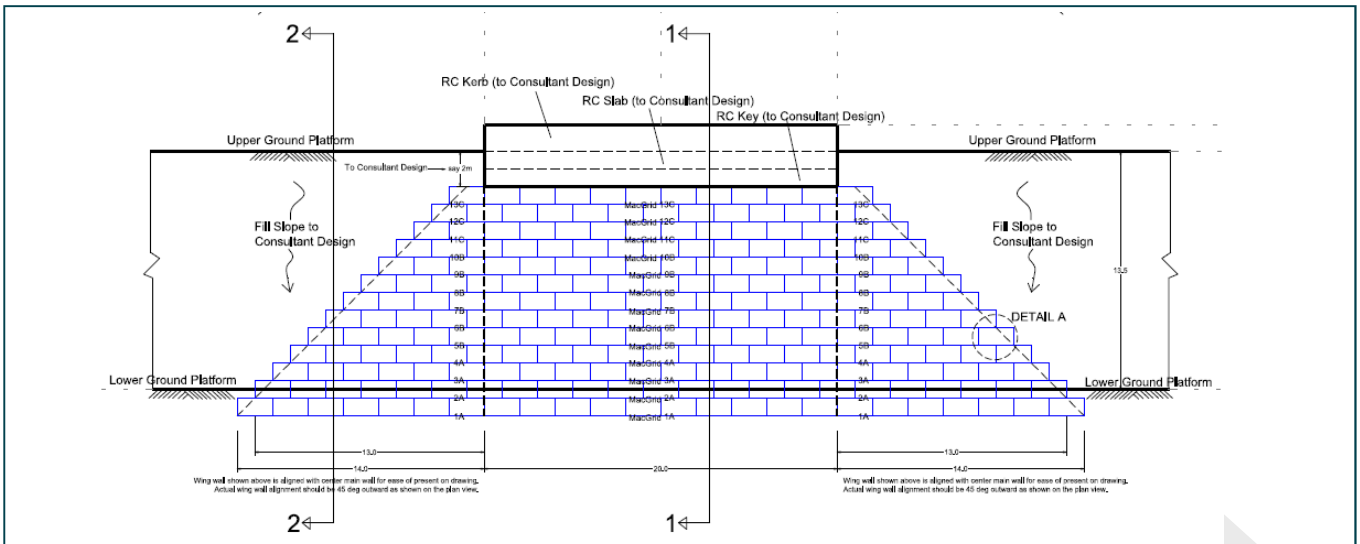
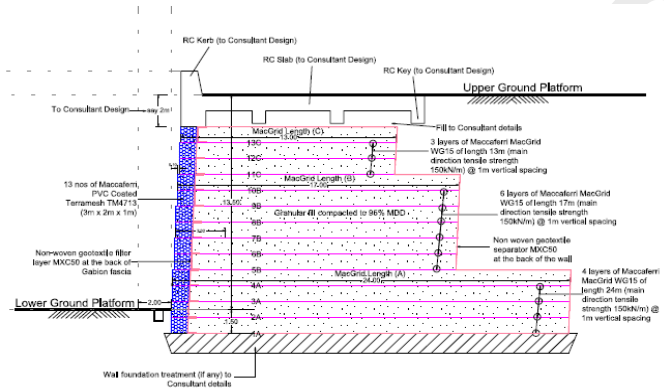


ELEVATION VIEW

Elevation View Date: May 2012



SECTION 1-1

Aerial view of jobsite

Arranging the wall alignment

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MACCAFERRI

CASE HISTORY

Rev: 02, Issue Date : May 4, 2015

THE CASITAS AT CANYON RANCH SLOPE PROTECTION

Carmona, Cavite, Philippines

ENVIRONMENTAL / GEOTECHNICAL / MECHANICALLY-STABILIZED EARTH RETAINING WALL / SOIL REINFORCEMENT / SLOPE PROTECTION

Products: Maccaferri Green Terramesh, MacGrid Geogrid, MacTex Non-woven Geotextile

Problem

A 9m-meter high retaining wall in The Casitas Project by Century Communities Corporation (CCC) was deigned to separate the upper and lower blocks of residential units. Initial design required a retaining wall with concrete blocks fascia but was found to be unsuitable. A green slope finish was preferred instead since the area was also planned as the exhibit spot in promoting the ongoing development. Also, cost was one of the factors that must be considered in the proposal.

Solution

The CCC (Project Owner) has favorably accepted the proposal submitted by Maccaferri Philippines, Inc. using **Green Terramesh System** (with 70 degrees facing angle) for the first six meters height of reinforced slope. Halfway through the construction, the Owner decided to increase the height of the reinforced slope to nine meters in total. **MacGrid Geogrid Wrap-around System** was designed for the remaining height of the slope. The slope fascia was later hydro-seeded for vegetation and green facing.

A field engineer supervised the installation to ensure that the soil was compacted according to the requirements. The combined system provided the aesthetic finish required by the Owner without compromising the integrity of the slope.

Before Construction June 2007

During Construction June 2007

Project Owner

Century Communities Corporation

General Contractor

VJS Builders

Consultant

Maccaferri Products

1,755 sq.m. Maccaferri Green Terramesh **878 sq.m. MacGrid Geogrid** **10,260 sq.m. MacTex Geotextile**

Construction Info

Start of Construction	**:**	**June 2007**
Completion Date	**:**	**October 2007**

THE CASITAS AT CANYON RANCH

Carmona, Cavite, Philippines

MACCAFERRI

Near Completion October 2007

Project Completed November 2007

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Engineering a Better Solution

MACCAFERRI

CASE HISTORY

Rev: 00, Issue Date : May 2015

CARMONA-GMA CAVITE BRIDGE SLOPE PROTECTION

Carmona, Cavite, Philippines

ENVIRONMENTAL / GEOTECHNICAL / MECHANICALLY-STABILIZED EARTH WALL / SLOPE PROTECTION / SOIL REINFORCEMENT

Products: System Terramesh, MacGrid Geogrid, MacTex Nonwoven Geotextile, MacDrain Geocomposite Drain

Problem

An old truss-type steel bridge connecting the towns of Carmona and GMA in Cavite, Philippines has undergone rehabilitation to decongest traffic in the area by constructing a single lane bridge along each sides. In this, it has been required that a passageway shall be made by cutting through an existing slope about 16m to 20m high beside one of the abutments as an access way of drilling equipments for the installation of the new bridge's columns and piles. However, the constructed passageway was only temporary and as soon as the installation of the columns and piles has been finished, it must be closed again to provide support to the final stage of the rehabilitation. Also, it is to avoid similar accident in the area where a jeepney vehicle fell down the passageway.

Solution

Maccaferri's System Terramesh has been proposed for the slope protection. It is a type of mechanically-stabilized earth wall, wherein double-twist wire mesh units serve as the fascia of the built structure. The stabilized portion at the back of the facing is composed of compacted soils with reinforcements normally made of MacGrid geogrids of varying lengths depending on the result of the design.

Besides its constructability and being a cheap alternative to other gravity walls, another distinct advantage of using System Terramesh is its ability to be fitted to slope geometry requirements because of its size and flexibility.

During Construction January 2014

During Construction January 2014

Project Owner

DPWH Region IV-A Cavite 1st District

General Contractor

MarcBilt Construction, Inc.

Consultant

DPWH Region IV-A Cavite 1st District

Maccaferri Products

System Terramesh
MacGrid Geogrid
MacTex Geotextile MXL50
MacDrain Geocomposite W1061

Construction Info

Start of Construction	**:**	**January 2014**
Completion Date	**:**	**March 2014**

CARMONA-GMA BRIDGE SLOPE PROTECTION

Carmona, Cavite, Philippines

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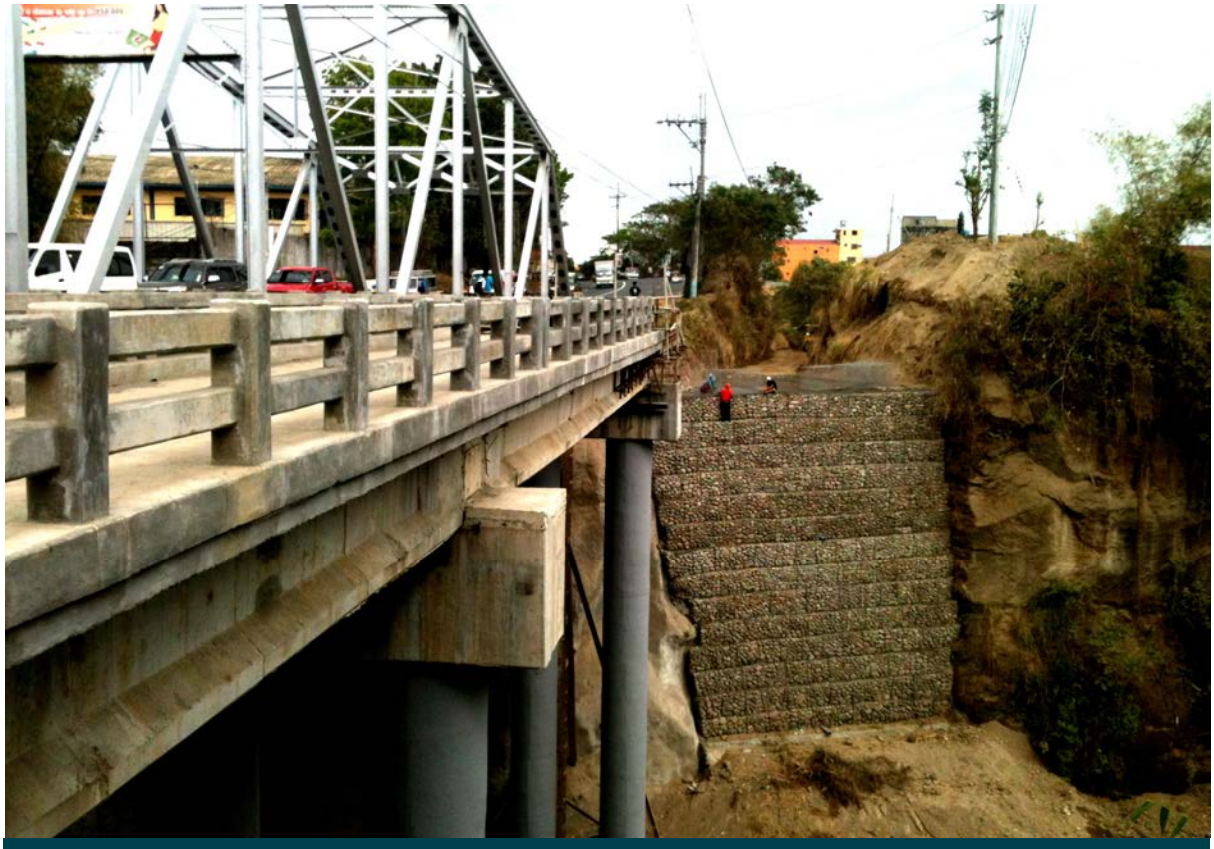
Near Completion March 2014



Near Completion March 2014

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Engineering a Better Solution

MACCAFERRI

CASE HISTORY

Rev: 02, Issue Date : May 2015

KAHUNA BEACH RESORT & SPA SLOPE PROTECTION

Brgy. Urbiztondo, San Juan, La Union, Philippines

ENVIRONMENTAL / HYDRAULICS / MECHANICALLY-STABILIZED EARTH WALL / EROSION PROTECTION / SOIL REINFORCEMENT

Products: MacWall Concrete Segmental Blocks, MacGrid Geogrids, Reno Mattress, MacTex Nonwoven Geotextile

Problem

Kahuna Beach Resort and Spa is located atBrgy. Urbiztondo, San Juan, La Union. During rainy season, erosion and scouring of beachfront occur and thus frequently result to damage of property. The Client and Owner of the beach resort wanted to have a permanent solution to address the problem. As per initial investigation, due to the existing slope condition, there was a limited space available for the construction of a retaining and defense structure. To make any proposal possible, cutting and filling of some areas were needed.

Solution

The solution proposed by Maccaferri (Philippines), Inc., was approved by the Project Owner. It involved construction of a mechanically-stabilized earth retaining structure and is known as Maccaferri MacWall System. It uses soil reinforcement materials (MacGrid Geogrids) combined with concrete block units (Diamond Pro) for the containment and stabilization of the backfill materials.

Maccaferri (Philippines), Inc. recommended to include an aggregate drainage layer and drain tile in the overall design to control surface run-off and reduce possible effect of buildup of excess pore water pressure inside the wall. The ease of construction, bio-engineered design and erosion protection mechanism were all delivered by the proposed system, thus the Client was very satisfied after completion of the project.

During Construction October 2009

During Construction October 2009

Project Owner

Kahuna Beach Resort & Spa, Inc.

General Contractor

Philippine-Sundt Construction & Dev't. Corp.

Consultant

Philippine-Sundt Construction & Dev't. Corp.

Maccaferri Products

7,425 units Anchor Diamond Pro Blocks
3,000 sq.m. MacGrid Geogrid (WG4)
4,400 sq.m. MacGrid Geogrid (WG6)
3,920 sq.m. MacTex Non-woven Geotextile

Construction Info

Start of Construction	**:**	**October 2009**
Completion Date	**:**	**December 2009**

KAHUNA BEACH RESORT & SPA SLOPE PROTECTION

Brgy. Urbiztondo, San Juan, La Union, Philippines

MACCAFERRI

Project Completed December 2009

Project Completed December 2009

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Engineering a Better Solution

MACCAFERRI

CASE HISTORY

Ref: ID / CH / RF01 — Rev: 00, Nov 2017

RIVER BANK PROTECTION AT CITRA GRAND

BEKASI, WEST JAVA, INDONESIA

Erosion Control

Product: Gabions, Reno Mattress, Terramesh System, MacMat, MacGrid WG

Problem

Ciputra, one of the biggest property developer in Indonesia, faced erosion issues for one of their new projects in Cibubur, West Java. Located not so far from the river, Ciputra wanted to protect the access road from the erosion and build the slope protection before the landslide come off and harm the area. Due to the combined action of the water flow causing the erosion of the slope and the heavy rainfalls saturating the clay soil of the slope, furthermore progressive road failure were occurring.
Rapid countermeasures in order to guarantee the safety of the housing area were mandatory.

Figure 1. The Area that will be Protected

Solution

Maccaferri as a slope protection specialist, provided cost-effective, environmental friendly, and tailored solutions for the client's problems. Using 3,5 m high Gabion made retaining wall as we can see at the figure 3 the stability of mass gravity retaining walls relies upon the structural integrity of the units and their filled mass, to support unstable earth slope. In addition, as scour protection of the Gabion wall, Reno Mattresses® were placed at the toe of the gravity structure (figure 2). Using 7 m high of Terramesh® System on the top of the structure as reinforced slope to make the slope more stable.

Maccaferri provided Maccaferri's Terramesh® System by reason of it combined the flexibility of soil reinforcement with the benefit of a modular system. Complete it with MacGrid® WG 15 as the primary reinforcement, enable soil to perform better than it would in its reinforced state and accommodate greater loads and stand at steeper angles.
Soil slopes subject to continuous erosion forces, whether natural or caused by man. For that reason some form of erosion control was required. Maccaferri used MacMat® for the long-term erosion control to facilitate the re-establishment of vegetation on the slope. MacMat® is very helpful to decelerate the water flow while rainfall.

All the stability checks were performed using the internally developed Maccaferri software (MacStars® W).
The retaining structure stability was checked under both static and seismic conditions. Furthermore, the stability during soil excavation and construction phases has been verified.
Maccaferri provided the Client with jobsite supervision and the Contractor with installation assistance in order to ensure that the highest construction and installation standards were followed. The construction works of the retaining wall lasted around 4 months.

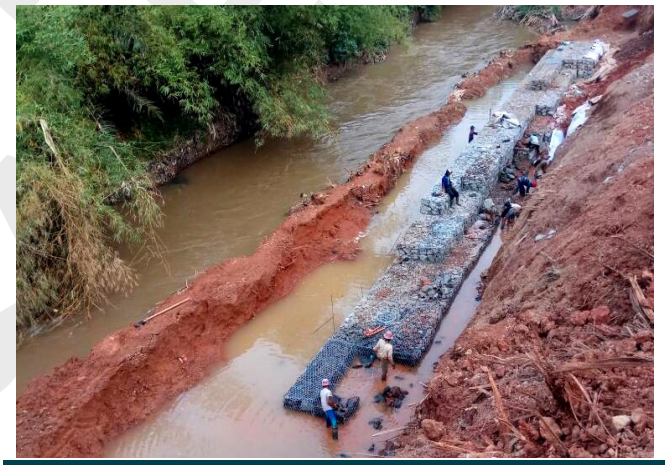

Figure 2. Installation of Reno Mattress as Scour Protection

Figure 3. Reno Mattress and Gabion Wall during Construction

Client:

CITRA GRAND CIBUBUR

Main contractor:

Designer:

PT. MACCAFERRI INDONESIA

Products used:

GABION, RENO MATRESS,TERRAMESH, MACMAT

Date of construction

JUNE 2017 —SEPTEMBER 2017

MACCAFERRI

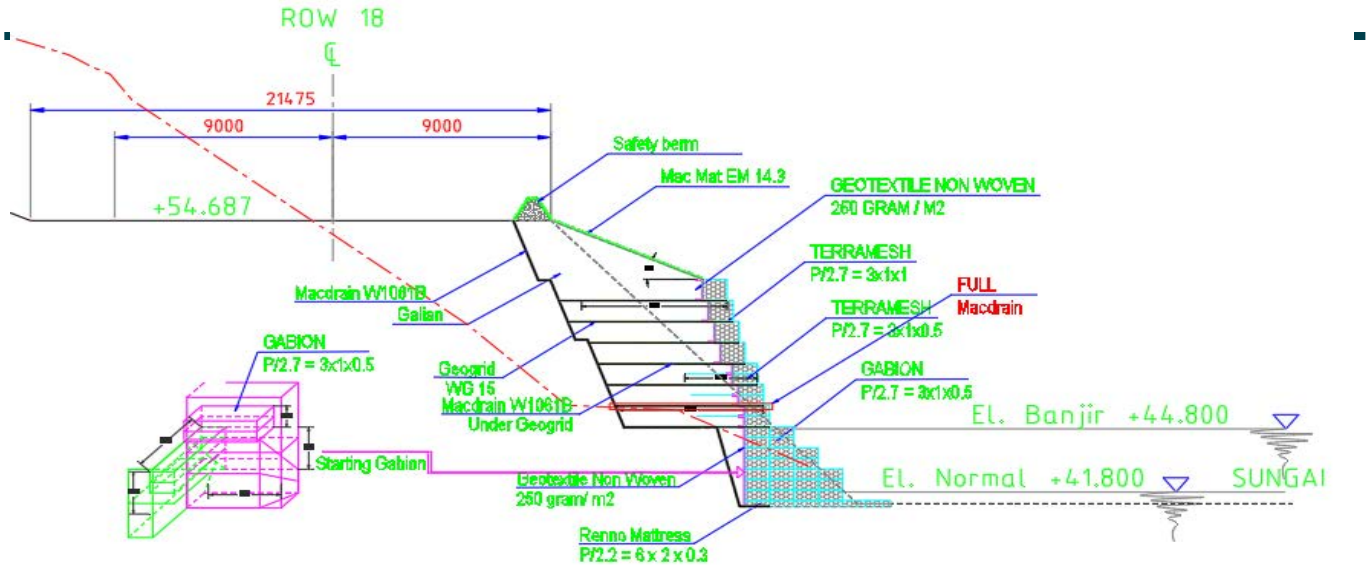

Figure 4. Typical Cross Section of the Structure

Figure 5. Installation of Maccaferri Terramesh System

Figure 6. Installation of MacGrid WG 15 for the Reinforcement

Figure 7. Installation of MacMat as Erosion Control

Figure 8. View of the Maccaferri Slope Protection and Erosion

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