

**KERJA-KERJA MENAIKBAIKI CERUN DI TEPI
JALAN RAYA, WAKAF DABUN, KUALA PILAH
DENGAN MENGGUNAKAN
MTS-GREEN MSE WALL SISTEM**

LAPURAN REKABENTUK

22th May, 2023

By



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KERJA-KERJA MENAIKBAIKI CERUN DI TEPI JALAN RAYA, WAKAF DABUN, KUALA PILAH DENGAN MENGGUNAKAN MTS- GREEN MSE WALL SISTEM.

Design Proposal

1.0 INTRODUCTION

This report presents the design proposal for the road embankment rehabilitation works along the kampung road in Wakaf Dabun, Kuala Pilah, Negeri Sembilan. The design and analysis methodology and assumptions will be first presented, followed by the evaluation of analysis results and finally recommendations for the proposed wall stabilization works to be installed will be highlighted.

In this case the conceptual design proposal is as followed:

- A) Using MTS-Green MSE Wall as reinforced wall system for road embankment.
- B) Gabion wall to act as a wall protection for the house at the platform level as shown in the drawings.

Site Pictures:





2.0 ASSUMPTIONS

Due to the lack of information about the site (history, hydrology, subsoil & topography survey data, underground services, etc.), some assumptions were made to accomplish the design proposal based on the knowledge and engineering judgements of the designer. All engineering assumptions have to be verified and confirmed by soil investigation and topography survey.

3.0 DESIGN & ANALYSIS

Section of the proposed slope rehabilitation was modelled and checked for stability. The acceptable slope stability safety factor for the proposed slope treatment is set to minimum 1.5.

Using the reinforced slope stability analysis German software GGU Stability, numerous trial slip circles were tried out and the slip for the lowest safety factor was presented.

The related design parameters are given as below:

a. Soil Engineering Parameters

Layer (top down)	Description	Soil Model	Bulk unit weight, γ (kN/m ³)	Design cohesion, C' (kN/m ²)	Design soil internal friction, ϕ' (°)
1	Backfill/Retained soil	Mohr-Coulomb	18	5	29
3	Foundation base - crusher run	Mohr-Coulomb	22	0	36
4	Retained Soil	Mohr-Coulomb	18	5	33
5	Foundation soil, L1 < 8m	Mohr-Coulomb	18	5	34

b. MTS-Green MSE Wall Parameters

Ultimate Tensile, T_u (kN/m)	Installation damage factor, f_1	Durability factor, f_2	Creep factor, f_3	Design Value, T_{des} (kN/m)
MTS-Green MSE wall				
47	1.05	1.05	1.12	38

The allowable long-term design tensile for the Reinforced Gabion Mesh or Green MSE wall for example,

$$T_a = T_u / (f_1 + f_2 + f_3) = 38 \text{ kN/m.}$$

Both the external conditions (local stability) of the wall and the internal stability of the slopes are checked. The external stability shall be verified separately when all necessary information has been acquired.

The result of the analysis shows satisfactory safety factors as shown in Appendix A.

The Factor of Safety (FoS) for local stability is 1.62 and the FoS for internal stability (General wedge) is 1.50

4.0 RECOMMENDATIONS & CONCLUSIONS

Basically, our proposed rehabilitation design is a combination of the following elements:

1. Drainage controls – filter and separation nonwoven geotextile fabric is used as a drainage media to cater for the infiltration during and after construction.
2. Slope reinforcement – the use of MTS-Green MSE wall as slope/wall is not only to stabilize the slope but also encourages grass to grow and becomes an environment “greening effect” especially in the urban area.
3. Temporary protection – the excavation for the wall construction shall ensure the short-term stability of the excavation slopes.

The proposed design can be constructed easily. The excellent flexibility aspect of the MTS-Green MSE wall system for river protection repair work is another advantage over the conventional rigid wall system. We believe the above proposal suits the tight budget constraint of the project without sacrificing the stability aspect.

5.0 LIMITATIONS

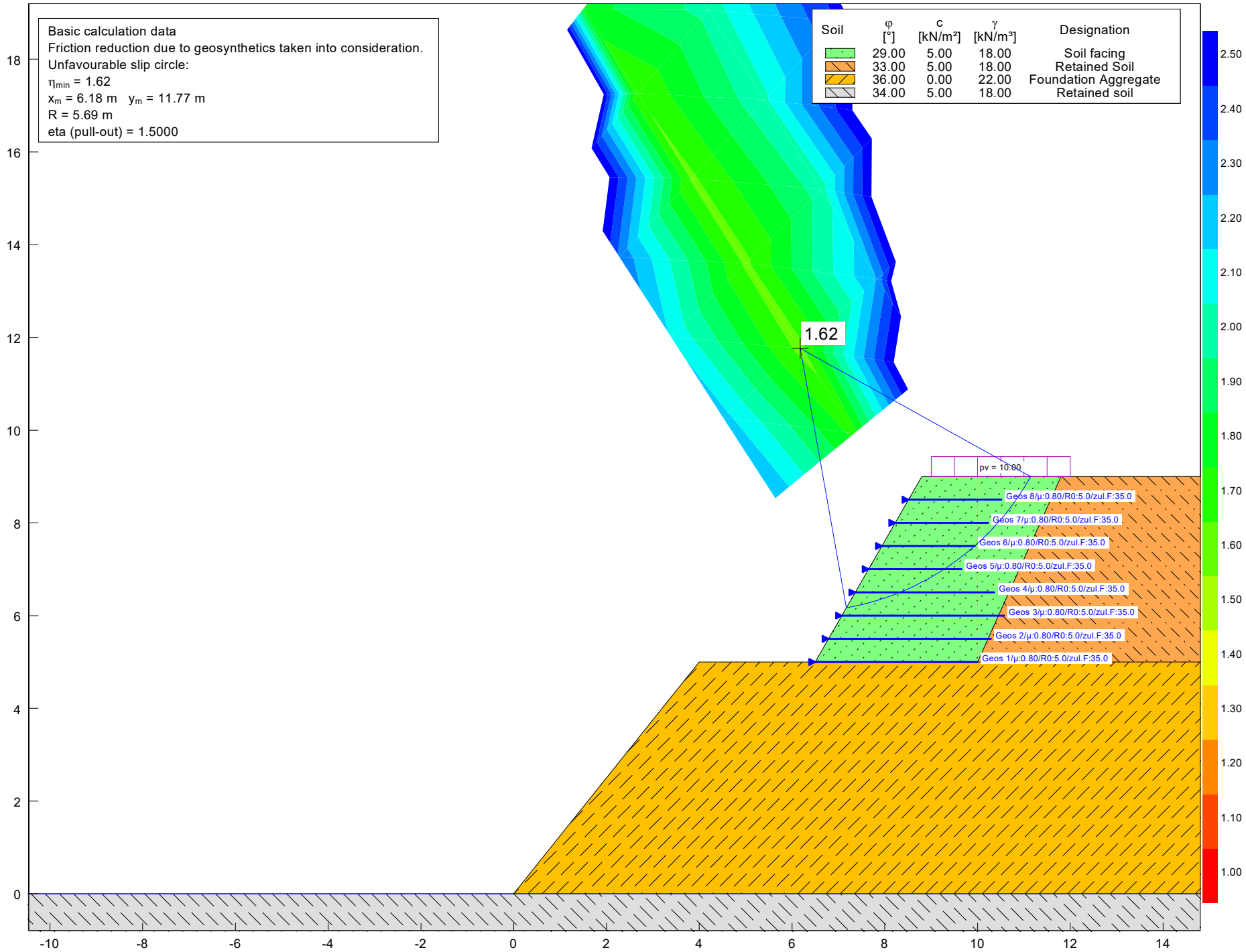
The design proposal was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by engineers practising in this or similar localities. No warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

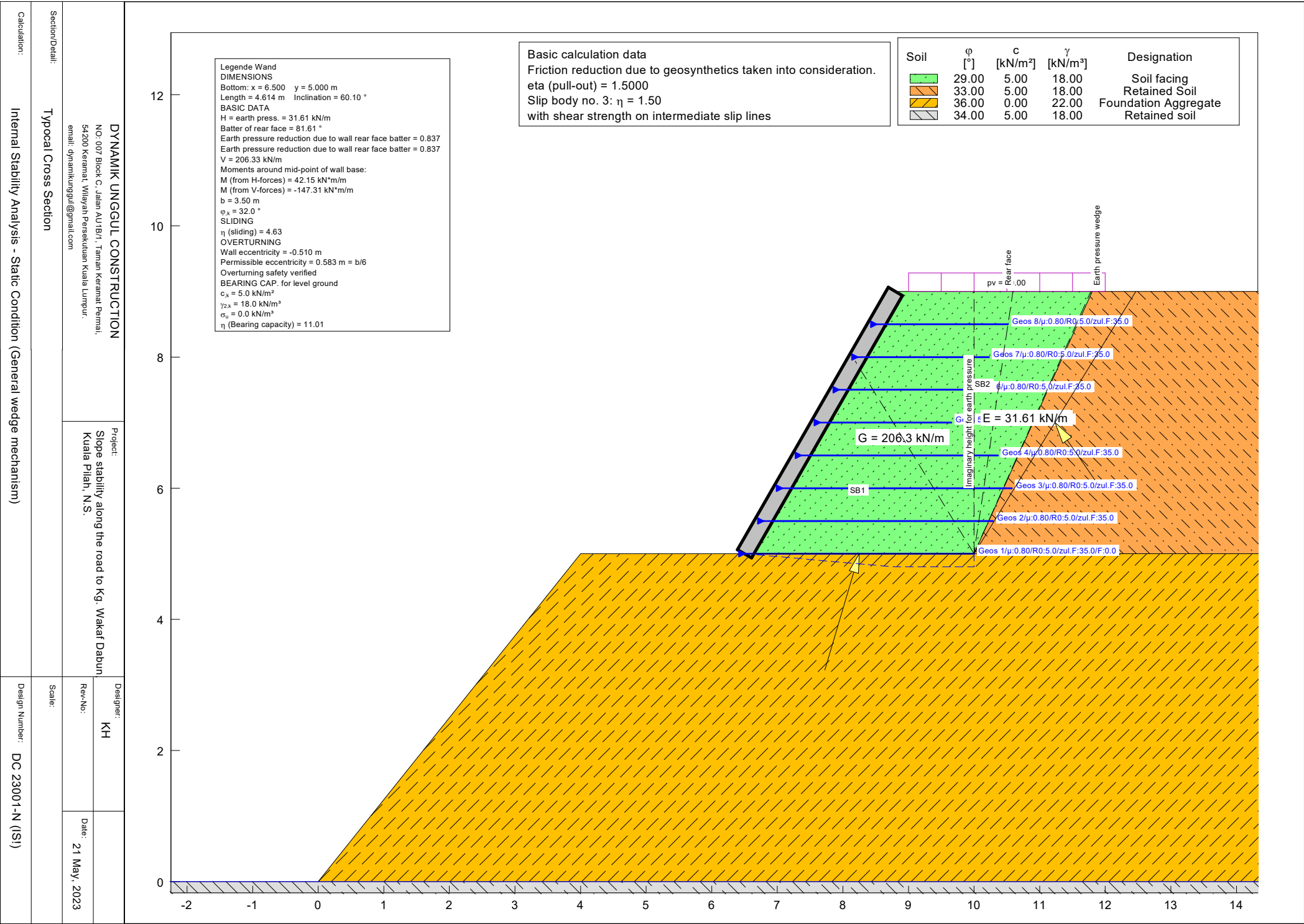
The assumptions and engineering judgements made to accomplish the proposal are believed to be representative of the entire contract area. However, as revealed by many previous developments, the actual soil and geological conditions faced during the construction may vary drastically from the soil investigation result. If this occurs, the changed of conditions must be evaluated by geotechnical engineer and revision or alteration of design may be made accordingly.

Appendix A

Slope Stability Analysis



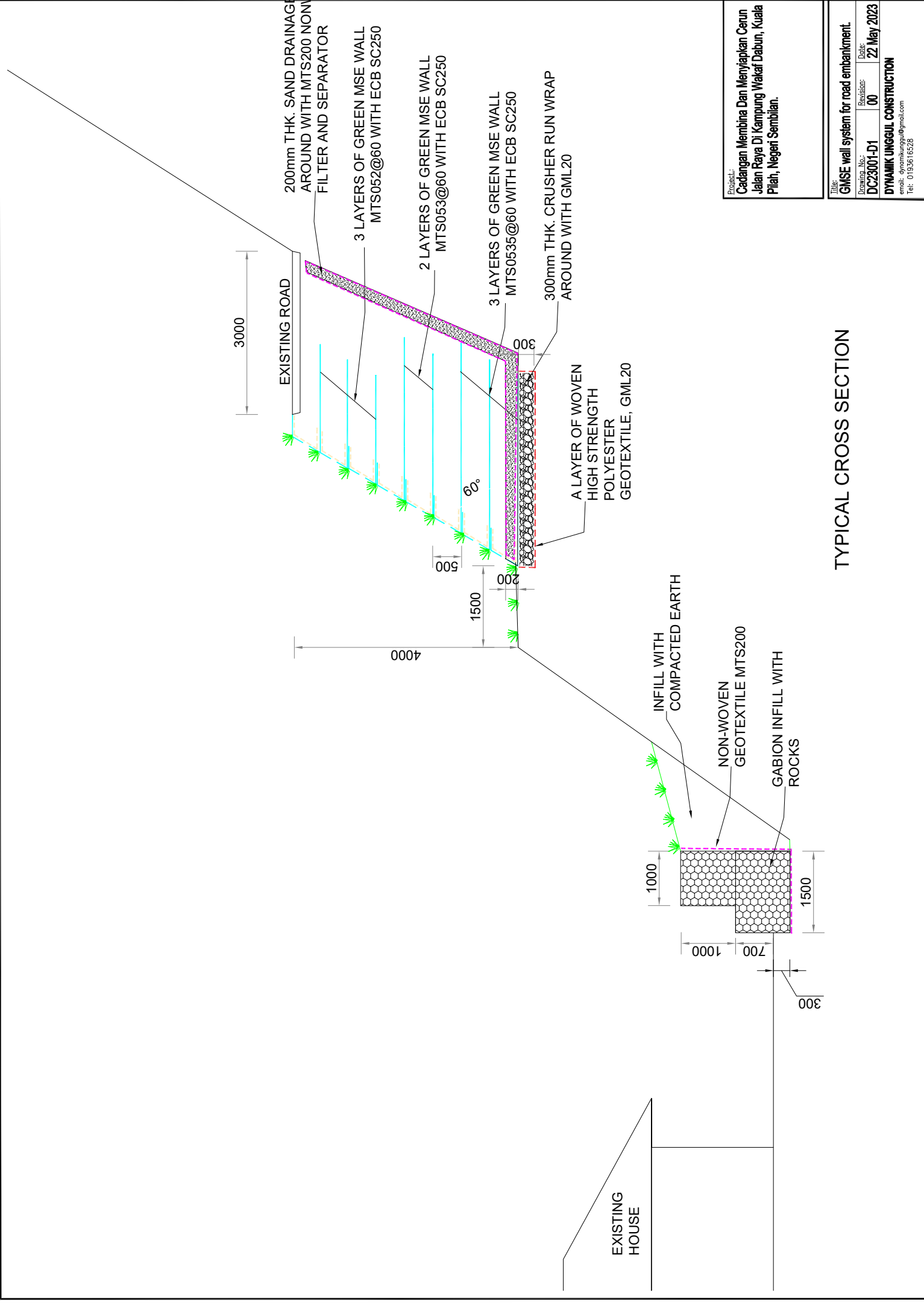


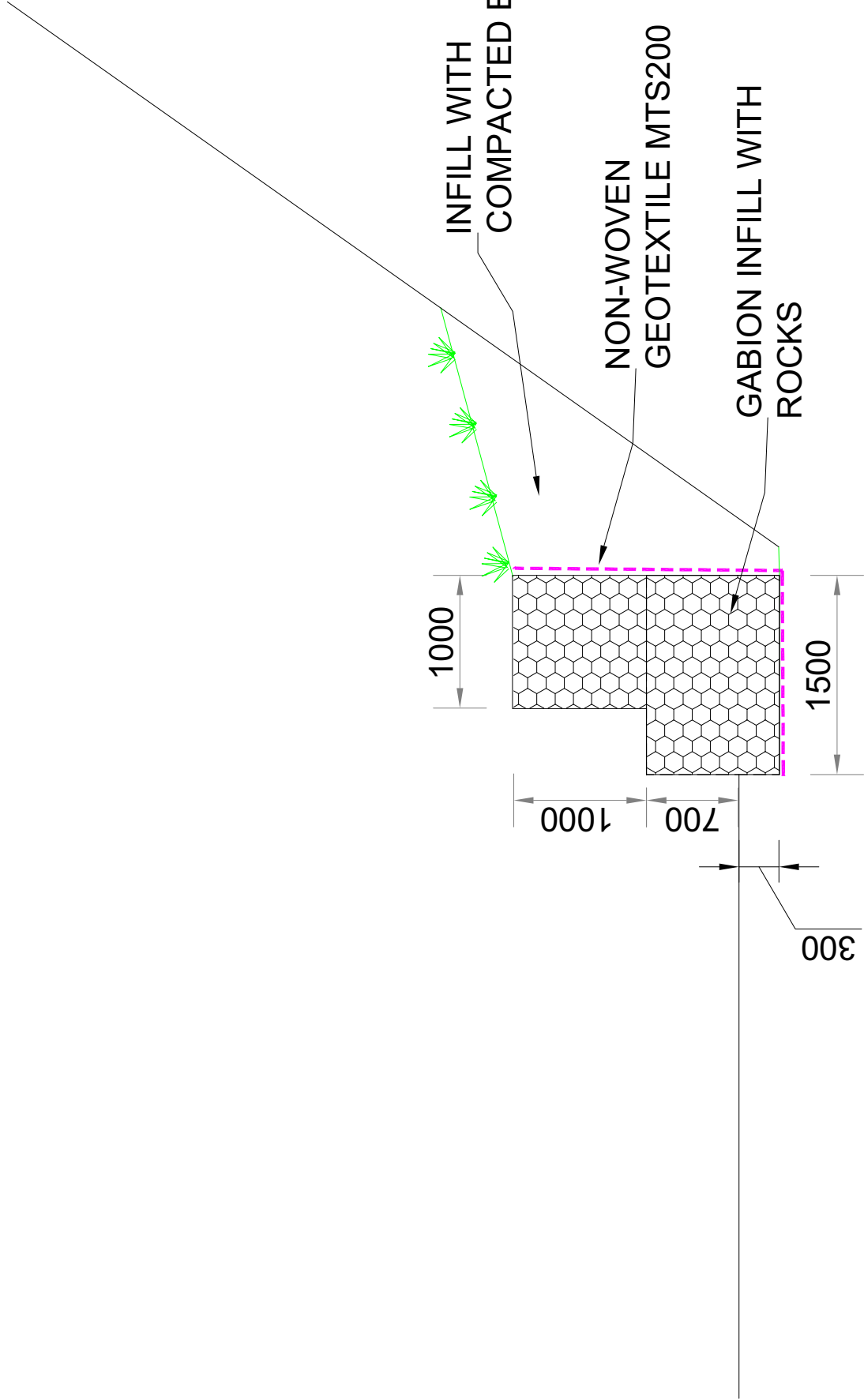


Appendix B

Drawings







TYPICAL CROSS SECTION

Project:
Cadangan Membina Dan Menyiapkan Cerun
Jalan Raya Di Kampung Wakaf Dabun, Kuala
Pilah, Negeri Sembilan.

Title: Gabion Details for the Platform level.		
Drawing No.:	Revision:	Date:
DC23001-D3	00	22 May 2023
DYNAMIK UNGGUL CONSTRUCTION		
email: dynamikunggul@gmail.com		
Tel: 0193616528		

Appendix C

Specification



Gabion & Mattress



Gabions And Mattress

Generally gabion are wire fabric containers, uniformly partition, of variable sizes, interconnected with the other similar container and filled with rocks or stone to form a flexible, permeable monolithic structure such as retaining wall, landslide prevention structure, erosion and scour protection work as well as various type of hydraulic / coastal structure for river, sea, and channel protection.

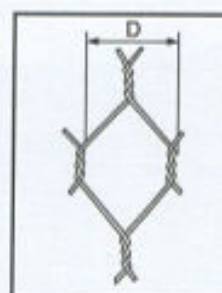
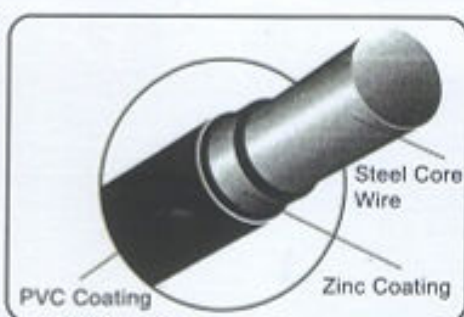
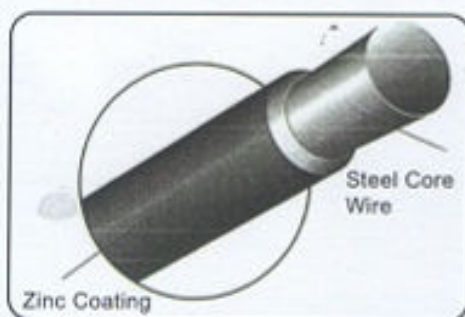


General Descriptions

- Gabion and mattress are manufactured from heavily galvanized wires mesh woven with the joints formed by triple twist into a hexagonal mesh form which does not unravel if cut.
- For application in corrosive condition such as marine and polluted area, the wires shall be extruded with a U.V stabilized PVC coating which are capable of resisting deteriorous effects of natural weathering exposure and immersion in salt water.
- Depending on the application and requirement, these gabion can be manufactured in different sizes i.e length and width with a diaphragm (partition) at every 1.0m along the length.

General specifications

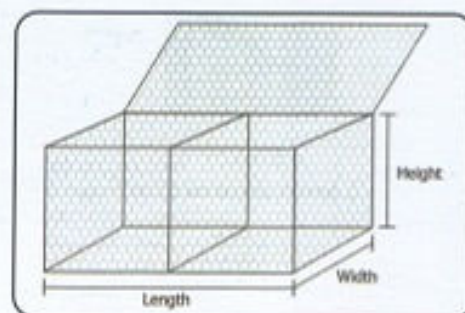
All wires used in manufacturing, in mild steel wire, annealed type, with tensile strength of 38 – 55kg/mm². to ensure a thick well-adhered zinc coating, all wires are heavily galvanized, conforming to its minimum zinc coating weight and zinc coating adhesion requirement which is checked by rigorous wrapping test.



Mesh Dimensions:

Mesh Type	D(mm)
6 x 8	60
8 x 10	80
10 x 12	100

Gabion Type	Galvanized	Galvanized & PVC (I.D/O.D)
Mesh Wire	2.7mm	2.2mm / 3.4mm
	3.0mm	2.77mm / 3.8 mm
Selva Wire	3.4mm	3.4mm / 4.6mm
	Nominal mesh size	80mm x 100mm
		or
		100mm x 120mm
	Overall size	Length (L) : 1m, 2m, 3m, 4m
		Width (W): 1m
		Height (H): 0.3m, 0.5m, 1m
		Order Code : L x W x H



* I.D = Inner Diameter
O.D = Outer Diameter

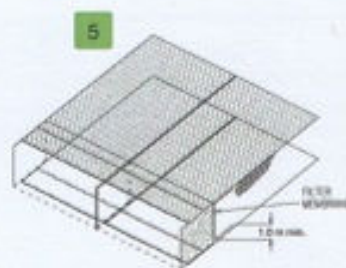
Gabion & Mattress



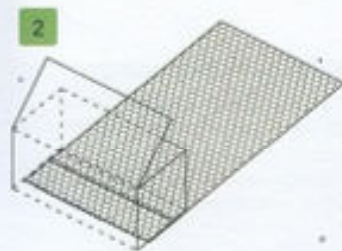
Method Installation of MSE Gabion Wall



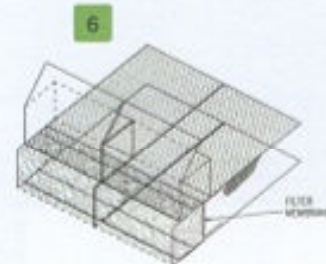
Individual gabion is first unfolded on flat ground and stamped to remove all kinks, the side panels are then raised upright and tied to the edges of body panel.



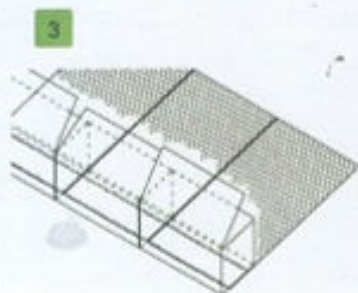
The next layer of reinforcement panel is securely tied to the lid of rockfilled gabion, along two locations along the entire length of gabion lid.



Reinforcement panel of required length is attached to the base of facing gabion with thick tie wires, at two locations along the full length of gabion base.



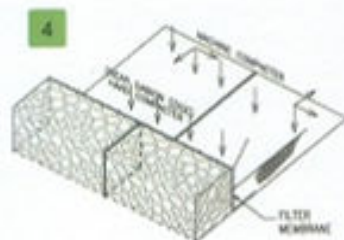
The next layer of facing gabions can then be placed over this new layer of reinforcement panel and tied to adjacent gabions, before rockfilling can commence.



Individual facing gabions with attached reinforcement panels are aligned to their required positions and securely laced along the edges to adjacent gabions. All reinforcement panels must also be tied to adjacent panels along their entire length.



Step 4 to 6 are repeated until the required wall height is achieved.



After rockfilling of facing gabions is completed, a layer of filter membrane must be placed behind the back of facing gabion before backfilling with suitable material. Compaction to required density in layers of approved thickness is then carried out with suitable machine compacter. Hand compacter should be used near the inner edge of facing gabion to prevent excessive bulging of facing gabion.

Fibromat Green MSE Gabion Wall

FGGW is defined as PVC coated heavily galvanized steel wire mesh panel of various sizes partially reinforced with brackets, reinforcing bars, and steel mesh combined with DC400 folded to form a soil retaining structure with a continuous panel, extending into the soil to act as soil reinforcement.

The selvages of the FGGW are the thicker perimeter and edge wires to which the wire mesh is securely tied to withstand sudden or gradual stress from any direction.

Lacing wire stainless steel clips are to be used to assemble and join the FGGW.

Unit Sizes

FGGW system shall be mechanically pre-fabricated in such a manner that it can be assembled at the construction site into the standard sizes indicated below.

Mesh Type	80mm
Width (W)	2m
Length (L1)	1m
Length (L2)	3m, 4m, 5m, 6m
Depth (D)	0.60m
Angle ('a)	To suit design

All FGGW dimensions shall be within a tolerance limit of 5% of the required size.



4.0m long facing gabions fabricated in horizontal mesh were used



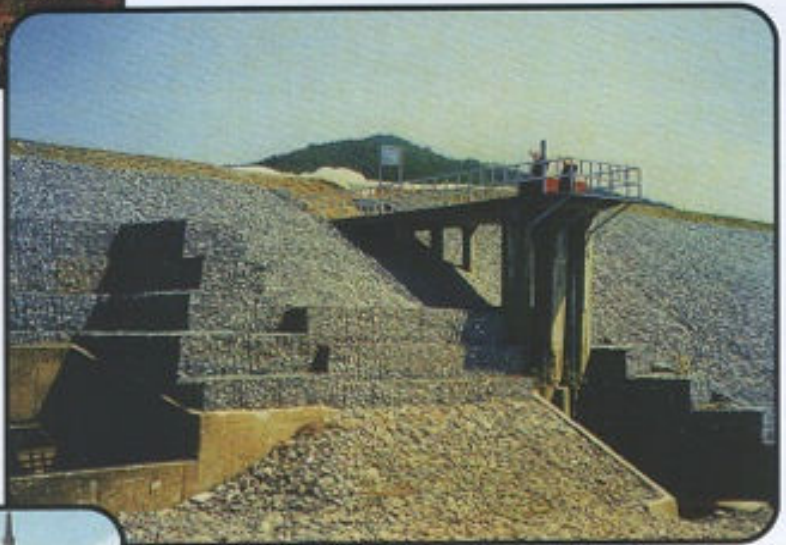
A 7.0m high 50 metre long MSE Gabion Wall being constructed



Adjacent 2.0m wide Panels were laced along their entire length and sandwiched between facing gabions prior to rockfilling



←
Bridge Abutment Protection
Tanjong Malim, Malaysia



→
Kyoungnam Province, South Korea



←
Putrajaya, Malaysia



→
MSE Gabion Wall
Seremban, Malaysia

Fibromat Green Mattress

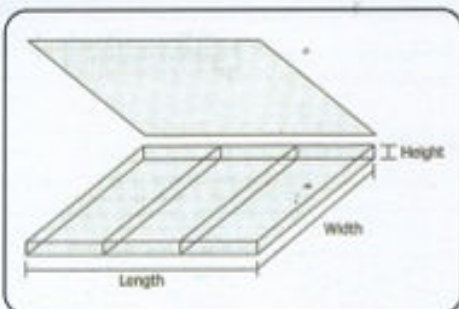
Description

Fibromat's Green Mattress is a composite consist of Gabion Reno Mattress, DC400 Coir Matt, P500 Secumat Three Dimensional Matt and Geotextile, designed to maximize performance through three phases of reinforcement of vegetative lining from unvegetated to vegetation establishment up to vegetation maturation. This specially designed composite mattress in-corporating rip-rap and soil encased in the gabion together with turf reinforcement matrix and geotextile as a separator and to hold the soil particles and vegetation establishment.



Specifications

The flexible wire mesh are woven from pairs of wires triple-twisted into a hexagonal mesh from which does not unravel if cut. The edges are selvedge mechanically with a thicker wire to give the mesh rigidity when subjected to tension.



Gabion type
Mesh Wire
Size
Selvedge Wire
Size
Mesh Size
Overall Size

Heavy Galvanised

2.7 mm or 3.0 mm

3.4 mm

8 cm x 10 cm or 10 cm x 12 cm

- Length : 1M, 2M, 3M, 4M

- Width : 1M

- Height : 0.3M, 0.5M, 1M

eg : 4M x 1M x 1M (LxWxH)

PVC Coated Heavy Galvanised

2.2mm (Core Wire Dia.), 3.4mm

(Overall Dia.) or

2.7mm (Core Wire Dia.), 3.8mm

(Overall Dia.)

3.4mm (Core Wire Dia.), 4.6mm

(Overall Dia.)



Gabion type
Mesh Wire
Size
Selvedge Wire
Size
Mesh Size
Overall Size

Heavy Galvanised

2.0mm or 2.2mm

2.7mm

6cm x 8cm

- Length : 3M, 6M

- Width : 1M, 2M

- Depth : 17cm, 23cm, 30cm, 50cm

eg : 6M x 2M x 30cm (LxWxD)

PVC Coated Heavy Galvanised

2.0mm (Core Wire Dia.),

3.1mm (Overall Dia.)

or 2.2mm (Core Wire Dia.),

3.3mm (Overall Dia.)

2.7mm (Core Wire Dia.),

3.8mm (Overall Dia.)

Tying Wire

Heavy Galvanised 2.2 mm
(for all Galvanised Gabions
& Mattresses)

PVC Coated 2.2mm / 3.3mm
(for all PVC Coated Gabions
& Mattresses)

Lid Cover

Specification For Lid Cover



- Gabion Mesh
- Coir Fiber 400gm/m²
- PP Netting S25
- P500 Secumat

P500 Secumat

Three Dimensional Matt



Specification

Element Properties	
Raw Material	polypropylene
Iso 9864	500 g/m ²
Strength (MD) – EN10319	>2.0 kN/m
Strength (CMD) – EN 10319	>0.4 kN/m
Nominal Thickness EN ISO 9863-1	10 mm
Colour	Black
UV Resistance	Stabilised
Roll Size	2m (w) x 25m (L)

Fibromat P500 Secumat is a three-dimensional erosion control matt consisting of a high strength UV stabilized labyrinth-like extruded monofilament polymer core. Secumat controls surface erosion and helps to anchor and reinforce the root zone of plants. A layer of coconut fiber being attached together with secumat as separator and moisture retention layer to enhance seeds germination.

Secumat erosion control mats are used for slope and ground protection in civil and landfill engineering works. Secumat prevents the sliding and washing out of the soil and cover layer while facilitating rapid vegetation growth. Upon heavy rains and water flows, the reinforcing ability of Secumat prevents erosion of the otherwise vulnerable vegetation. Once, vegetated, Secumat reduces runoff velocities and thereby increases infiltration and reduces discharge. Directly next to water courses, Secumat protects the banks from the scouring action of water flow.

Coir Fibre-DC 400

Erosion Control Blanket



Technical Specifications

Matrix	Coir Fiber
Content	100%
Weight / Sq.M	400gm/M ² ± 10%
Netting	
Material	Pp Uv Stabilized
Mesh Shape	Quadrangular
Color	Black
Tensile Strength Md	2.2kn/M
Tensile Strength Td	2.2kn/M
Yield Point Elongation Md	13%
Yield Point Elongation Td	13%

Geotextile

Non-woven Geotextile



Specification

Type	Tensile Strength	Unit Weight	Thickness	CBR puncture strength
	kN/m	g/m ²	mm	N
MTS250	19.0	250	2.2	2900

Testing & Product Development



Six meter high MSE Test Embankment



Field Pullout Test set up



Puncture test on PN 8/2.7 panel



Deformation of panel during loading



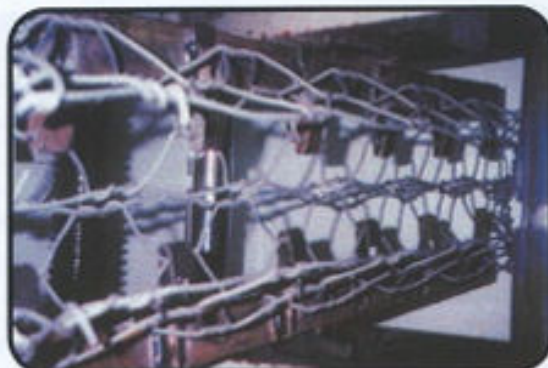
Tensile Test In Air (in the direction of twist)



Tensile Test In Air (perpendicular to the direction of twist)



Compression test on rockfilled gabion



Connection strength of 3.0mm diameter C shaped rings

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