



SINGAPORE, SINGAPORE

Slope stabilisation at Furama Riverfront Hotel





Case Study

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| Project: | Slope stabilisation at Furama Riverfront Hotel |
| Year Completion: | 2024 |
| Material: | Geotextile GeoBags |
| Designer, Distributor & Contractor: | Hocklim Engineering Pte Ltd |

The Challenge

During the monsoon season, Singapore has seen unprecedented levels of heavy rain and flash flood, leading to a landslide on a slope that connected Outram Secondary School to the Furama Riverfront Hotel, located near Jalan Minyak and York Hill. The landslide occurred on a section of the slope that has been stripped of any vegetation foliage.

Figure 1: Landslip occurrence near Jalan Minyak and York Hill

The Solution

To repair the collapsed slope and prevent further occurrence of landslip in that area, installing the GeoBarrier system for soil stabilisation to the section of the slope prone to landslip was the solution. This environmental solution was introduced and has been used by Hocklim since 2020 for soil slope stabilisation. However there were a few difficulties with installing the single terrace GeoBarrier system on the existing slope. As the existing slope has a height of 22 metres, utilising the GeoBarrier system with a single terrace would not allow the efficiency of dispersing the sub soil water due to a high concentration of sub soil water in the slope.

Secondly, there is a great difference in the gradient of the existing slope (32 degrees) and the GeoBarrier system (70 degrees). This results in a stability issue when installing the single terrace GeoBarrier system as the need to compensate the difference in the slope gradient with a large volume of backfilled soil. This not only incurs a higher cost but also the GeoBarrier will not blend in well with the existing surrounding slope contour due to the huge slope gradient difference with the existing surrounding slope, especially at the crest of the slope.

Design of multi terrace GeoBarrier System

With the difficulties of installing the single terrace GeoBarrier system on the existing slope, extensive planning to design a customised GeoBarrier system utilising a multi terrace platform concept was born. This is the first multiple terrace platform concept to be introduced globally. In order to mitigate the requirement of long geogrid, i.e. around 15.4m length, the ground lock system was introduced for the project to protect the Geobarrier system from any soil erosion during heavy rainfall.



Figure 2: Layers of Geobags installed in the multi terrace GeoBarrier system.



Figure 3: Installing the ground lock system

Features of multi terrace GeoBarrier System

The current multi terrace GeoBarrier system design used at York Hill comprises of 5 terraces. These terraces serves many purposes. Firstly, each terrace consists of a surface runoff and sub soil drain at the toe of the terrace. The 5 drains greatly increase the efficiency of dispersing the sub soil water and surface runoff water to prevent the building up of a high concentration of sub soil water in the slope.

Secondly, each terrace has a berm where it serves as a working platform during the construction of the next terrace to store materials and access for machinery.

Lastly, the multi terraces reduces the gradient difference between the existing slope and the GeoBarrier system thereby blending the Geobarrier system more naturally with the existing slope contour.



Figure 4: Constructing the surface run off drains at the toe of the terrace.



Figure 5: Utilising the working platforms to store materials and access for machinery.

Site accessibility

The working site was located at the back of Furama Riverfront Hotel via a narrow fire engine access path. Due to the unique working setting at a hotel's location, Hocklim had to ensure delivery of materials and onsite operations do not disturb the hotel's operations or bring inconvenience to the hotel's guests.

The constraints of delivering materials through a narrow fire engine access where materials had to be delivered in batches while ensuring minimal disruptions to the hotel's operations greatly impacted the project's timeline.

Hocklim had to find alternative ways to run our operations more efficiently to meet the timeline. One way was to create another site access point by accessing the back of the site at the crest of the slope on Jalan Minyak. By utilising the multi terrace working platforms, Hocklim was able to deliver materials from the crest of the slope to their respective terrace for storage.

This project showcases Hocklim's expertise in sourcing solutions by utilising the initial unstable slope onsite area and turning the area into a usable material storage and access for machinery base on the new multi terrace working platform GeoBarrier system design.



Figure 6: Excavators delivering materials from the crest of the slope to the respective working platforms

With the installation of the multi terrace GeoBarrier system, it is not only successful in mitigating the torrential rainfall for high slopes by utilising more surface run off drains to remove excess sub-soil and surface water efficiently but also able to blend in with the surrounding slope contours making it a natural, reliable and effective climate resilient solution.