

Sustainable Vegetation System on Steep Concrete Slope at Princess Margaret Hospital Building

The Princess Margaret Hospital at Kwai Chung, operated under the Hospital Authority, was the first large project that adopted Toyo-Mulching System in Hong Kong. The project site is near Princess Margaret Hospital where many residential buildings nearby. Patients and residents always walk pass the site.

The hillside below the Hospital is a rock and soil mixed slope with 100 mm thick-shotcrete cover of area 5,000sqm. The height ranges from 5 m to 10.8 m and the slope length is about 93 m orientated from East to South West. The slope gradient facing the South-West is generally 55°, but the gradient increases to about 80° facing to the East. The slope is exposed to strong wind in winter and it is highly exposed to sunshine. To improve the outlook of the slope, grass (Bahia, Bahia), ground cover (Wedelia) and climber (Purple bean) have been planted and works have been completed within three months from September 2000 to November 2000.

Toyo-Mulching System is an innovative vegetation system, which makes it possible for natural vegetation to grow on non-soil slope

surface including shotcrete, rock, no fine concrete or chunam slope. The technique is first introduced to Hong Kong in 1999. Since its application, the system is proven to be excellent and outstanding for vegetation cover on steep non-soil slope.

This system is highly applicable on steep slopes because of the following three key factors:

- 1) *Geosynthetic:*
The system selects a suitable matting system to reinforce the planting media and prevent surface erosion.
- 2) *Horticultural selection:*
Suitable planting species can be established on steep slopes stably. The ecological equilibrium can be set up to keep moisture and nutrients in the system.
- 3) *Bioengineering properties:*
The materials encourage the growth of rooting system to hold soil particle, therefore, the washed out problem have been reduced effectively.

The natural fiber soil, named Soil-Factor, is a special material consisting of various components: seed mix, peatmoss, organic compost, chemical and soluble fertilizer and neutral bonding agent. This light substance was used as a good planting



Before vegetation, Sprayed Concrete Slope



After vegetation by Toyo-Mulching System

media to support the vegetation on the shotcrete slope holding particles strongly without washout. Through the gas porosity in the fiber soil, roots of vegetation can healthily develop and different types of plant species grow up on the slope to give green vegetation coverage all year round.

Aftermath

After completion of work, the slope was in brown as covered by the coconut fiber made erosion control erosion control mat. One month after, the pioneer species of grass seeds germinated which demonstrated the first step of greening up the slope. After six months, the slope was



Bahia grass 百喜草



Bemuda grass 百慕達草



Purple bean 紫花大翼豆



Wedelia trilobata 蟛蜞菊

covered with evergreen groundcover, *Wedelia trilobata*. It requires less maintenance than the grass species and is able to provide green coverage all year around.



Greening effect has been achieved

Steep Slope Vegetation Growth

Visual Enhancement

The slope was changed from a cool, grey shotcrete wall to a fresh and pleasant green slope. The greening of the slope provides a nice outlook and improves the environment with harmonious atmosphere. Native plant species including climbers, ferns and other ground cover have been invaded and established successfully on this steep slope.



Natural flowers, climber and ground cover grow harmoniously on the slope



Fern was found on the slope

All Year Round Green Coverage

After the completion of works, the slope is green in all seasons. It is covered with the perennial vegetation, dominating by *Wedelia trilobata*. Yellow small flowers blooming from

this climber can be seen throughout whole year.

Resistance to adverse weather condition

For the past years, the slope has undergone numerous adverse conditions such as red and black rainstorm signal even typhoon signal number 10. There were no significant wash out recorded. Thus, this can prove that the system is very reliable.

Achievement

The project was given awards locally and internationally.

1) Excellence in Technology - International Erosion Control Association

The project was awarded *Excellence in Technology 2003*, organized by International Erosion Control Association, Awards of Environmental Excellence 2003, USA. Only four awards were given annually and our company was given this honor.

This award was given to engineering projects that involved excellence technology. Our Toyo-Mulching System is therefore proved to be a very good technique for greening artificial slopes.

2) Greening Effect Merit Award - Leisure and Cultural Services Department

The project was awarded the *Outstanding Greening Project Award 2002*, organized by Leisure and Cultural Services Department, HKSAR. The award was given to companies, which has achieved qualified greening effect on slopes in Hong Kong.

It is co-organized with the Hong Kong Institute of Landscape Architects and the Institute of Horticulture (Hong Kong) to promote greening and environment-conscious development locally. This project has been given the award to

illustrate its prominent greening effect.

3) Best Landscaped Slope Award – Civil Engineering Department, HKSAR

The project was awarded *Merit Award in Best Landscaped Slope Award (2003 – 2004)*, jointly organized by Civil Engineering Department, HKSAR, The Professional Green Building Council, Hong Kong Association of Property Management Companies, and The Hong Kong Institute of Landscape Architects. The award was to promote public awareness in slope safety and aesthetics and arouse slope owners' interest in providing landscape treatment to their slopes when they carry out slope maintenance and upgrading works.

Improved Micro-environment

Now, the Toyo-mulching Mulching System is adopted by engineers and architects for establishing vegetation on steep non-soil slopes. Beside, more native shrubs and flowering plants can be planted into this system that will enhance the ecology of vegetation in Hong Kong.



Far View of the Slope



Excellence in Technology



Greening Effect Merit Award



Best Landscaped Slope Award