

Particular Specification of Toyo-Mulching System

GENERAL

General Requirement 1.01 Toyo-Mulching System is a vegetation treatment to the non-soil surface of slope such as shotcrete, no fine concrete, concrete buttress, bedrock or chunam with slope gradient not more than 75°. It should be carried out at locations as shown on the drawings or as directed by the Engineer.

The Hong Kong sole agent for this method is Toyo Greenland Company Limited at No. 58, South Section, Wah Shan Village, Sheung Shui, N.T.
(Tel. No.: 2639 9312 Fax No. 2377 2150)

List of Approved Suppliers of Materials and Specialist Contractors 1.02 If the Contractor is not included in the “ List of Approved Suppliers of Materials and Specialist Contractors for Public Works” maintained by the Employer for:

Landscaping Class II - Hydroseeding - Group II

Then he should enter into written sub-contractors with approved listed contractors, in the relevant Group, for the execution of respective part of the Works.

MATERIALS & EQUIPMENT

Turf Reinforcement Mat 2.01 It should be PVC coated rhombus galvanized wire mesh with diameter 2.5 mm, 50 mm/50 mm rhombus opening and 30 mm thickness when it is spread.

Auxiliary Anchor 2.02 It should be galvanized mild steel with 16 mm diameter and 400 mm length.

Subanchor 2.03 It should be galvanized mild steel with 8 mm diameter and 200 mm length.

Seeds 2.04 Grass seeds are imported in terms of species, varieties and purity. The origin of seed and the name of the supplier should be stated on the container or packing.

(1) The quality of grass seed should be gauged by purity, germination percentage and freedom from weeds. The total weed seed content should not exceed 0.5% by total mass and the total content of other crop seeds should not exceed 1% by total mass.

(2) The application rate for the Toyo-Mulching System should be as follows:

Species

Application Rate

Bermuda grass (<i>Cynodon dactylon</i>)	15 gram/m ²
Bahia grass (<i>Paspalum notatum</i>)	10 gram/m ²
Other seed may be selectively added as requested	

- Fiber Soil 2.05 (1) The fiber soil should be the Soil-Factor or equivalent material, supplied by Toyo Greenland Company Limited. It should be excellent in gas permeability and water-retaining capacity and can maintain fertilizer for a long period of time. Besides, it should be strong resistance to drought and rain erosion. High alkaline content material should not be used as bonding agent. The fiber soil consists of the following ingredients:

<u>Ingredients</u>	<u>Application Rate (per m³)</u>
(a) High grade Peatmoss	600 litre
(b) Wood chip compost	400 litre
(c) Chemical fertilizer (N:P:K = 13:3:11)	0.4 kg
(d) Chemical fertilizer (N:P:K = 4:17:4)	1.2 kg
(e) Perlite powder	4.0 kg
(f) Acrylic polymer granules	0.1 kg
(g) Bonding agent	9.0 kg
(h) Germination stimulator	1.0 kg

- (2) The properties of the fiber soil are:

(a) pH value	6.0 to 7.5
(b) Moisture content	30 % to 35 %
(c) Organic matter content (dry weight)	50 % to 90 %
(d) Organic Carbon content (dry weight)	40 % to 60 %
(e) Total Nitrogen content (dry weight)	0.1 % to 1.5 %
(f) Carbon: Nitrogen ratio	35:1 to 50:1
(g) Dry density	400 kg/m ³ to 450 kg/m ³
(h) Saturated density	350 kg/m ³ to 400 kg/m ³

- Erosion Control Mat 2.06 Erosion Control Mat should be made with approved coir mesh or equivalent materials. It should be natural coir fiber product and should not be degraded within 5 years after application or until the specified grass cover has been established.

Fertilizer Strip	2.07	Fertilizer strip or equivalent material is supplied by Toyo Greenland Company Limited. It should be a double-layer non-woven strip, which filled with approved slow-released fertilizer and water retaining agent.
Creeper Sprig	2.08	The creeper sprig should not be more than 150 mm long, but with more than 1 number of healthy nodes.
Planter Tube	2.09	It should be perforated PVC tube with 170 mm long and approximate 32 mm in diameter which filled with topsoil, post-planting fertilizer, moisture retaining crystal and 2 numbers of creeper sprig.
Spraying Machinery	2.10	The spraying machinery should be a wet spraying machinery that should be verified by the material supplier in order to facilitate the spraying of fiber soil.

Water and ingredients of fiber soil should be readily mixed before loading into the machine for spraying.

MATERIALS SUBMISSION

Submission	3.01	The following particulars of the proposed materials for Toyo-Mulching System and establishment works should be submitted to the Engineer, not less than 14 days before the commencement of works.
Particulars of Seed Mixture	3.02	A certificate or a numbered seed analysis report for each seed mixture issued within 6 months before the date of use of the seed showing the species and variety of the seed, the date of testing and including results of tests: <ul style="list-style-type: none"> (a) Percentage of germination of pure seed in a fixed period of time under standard laboratory conditions (b) Percentage of composition by weight, including details of impurities
Test Report of Fiber Soil	3.03	A test report of fiber soil issued within 6 months before the date of use should include details of the composition and results of test for: <ul style="list-style-type: none"> (a) PH value (b) Total organic matter (c) Moisture content (d) Carbon/Nitrogen ratio

- (e) Dry density
- (f) Saturated density

Particulars of Other Materials 3.04 The following particulars of the proposed materials and method statement of Toyo-Mulching System should be submitted to the Engineer:

- (a) Species and rate of application of grass seed and creeper sprig
- (b) Type and rate of application of water retaining agent, fertilizer and bonding agent
- (c) Detail of turf reinforcement mat, fertilizer stripe, anchor and subanchor
- (d) Type and detail of erosion control mat
- (e) Details of the company employed to carry out the hydromulching System. The company should provide at least 3-year local job reference of projects, which proved to be successful with all year round self-sustained vegetation.
- (f) Details of the equipment to be used
- (g) Details of the mixing yard

Samples of Materials 3.05 (1) Samples of the following proposed materials should be submitted to the Engineer at the same time as particulars of the material are submitted:

<u>Samples</u>	<u>Quantity</u>
(a) Fiber soil	10 litre
(b) Fertilizer strip	500 mm
(c) Turf reinforcement mat	1 sq. feet
(d) Auxiliary anchor	1 no.
(e) Subanchor	1 no.
(f) Erosion control mat	1 sq. feet

(2) Samples of materials for Toyo-Mulching System and the program of establishment works should be inspected and approved by the Engineer before the delivery of material to the site.

METHOD STATEMENT

Preliminary 4.01 The method statement and procedure of work should be read in conjunction with the detail of the drawing or as requested by the Engineer. All provisional works should be scheduled according to the different gradients and surface

conditions of slopes according to the instruction of Engineer.

Ground Cleaning	4.02	Weeds, rubbish, litter, stones exceeding 50 mm diameter and all deleterious material should be removed from the surface of the ground. Vegetation should be cleared without using herbicide unless permitted by the Engineer. If permitted, the herbicide should be a proprietary type approved by the Engineer and should be applied in accordance with the manufacturer's recommendation.
Fixing of Turf Reinforcement Mat	4.03	<p>(1) Fixing of turf reinforcement mat by the anchor and subanchor.</p> <p>(2) The auxiliary anchor should be fixed at a minimum of 1,000 mm c/c along the top of the slope if the system is applied on the slope without the shotcrete cover.</p> <p>(3) Minimum 50 numbers of subanchors should be fixed in every 100 m² of area.</p>
Installation of Fertilizer Strip	4.04	<p>(1) The double layer non-woven fertilizer strip filled with slow-released fertilizer and water retaining agent.</p> <p>(2) The fertilizer strip should be inserted horizontally into turf reinforcement mat at approximate 500 mm c/c.</p>
Extension of Weep Hole	4.05	If there is weep hole and ranking drain on the slope, it should be extended 100 mm further with similar material in order to avoid blocking of outlet after hydromulching.
Installation of Root Hole	4.06	<p>If the vegetation system is applied onto the sprayed concrete cover, the root hole should be drilled at approximate 32 mm diameter and 200 mm depth by mechanical or electricity drill. The PVC perforate planter tube will then be inserted into the root hole after the completion of spraying work.</p> <p>The spacing of the root hole should be at least 1,500 mm c/c in stagger pattern or instructed by the Engineer.</p>
Hydromulching	4.07	<p>(1) The fiber soil should be mixed with seed and water in an appropriate proportion.</p> <p>(2) The mixture will be sprayed by wet spraying machinery onto the surface until reaching thickness of at least 50 mm or covering the thickness of turf reinforcement mat.</p>

- (3) Walking on the area that have been hydromulched should be restricted to access unless the fixing protective fabric or the work of patching up.

Installation of Erosion Control Mat 4.08 The Erosion Control Mat should be laid and fixed with iron staple on the surface of fiber soil layer with anchor at approximate 1,000 mm c/c.

The overlapping of the mat should not more than 50 mm in order to prevent the interruption of the growth of vegetation under the mats.

Planting of Creeper Sprig 4.09 (1) Creeper sprig will be planted by hand plugging at 500 mm c/c if no planter tubes are installed.

- (2) 1 number of well-established planter tube will installed into the root hole for the work applied on the shotcreted slope.

ESTABLISHMENT WORKS

Establishment Works 5.01 (1) Establishment works should be carried out for the period stated in the Contract and in accordance with Clauses 5.04 to 5.06.

- (2) All necessary measures should be taken to ensure that vegetation cover become well-established and to keep the area tidy and free from litter and rubbish.

Inspection of Establishment Works 5.02 An inspection of Toyo-Mulching System and the establishment works should be carried out jointly by the Contractor and the Engineer at monthly intervals when required. The Engineer should instruct the Contractor to carry out establishment works when necessary; the work instructed should be completed within 14 days after the date of the Engineer's instruction.

Replacement of Vegetation 5.03 Vegetation coverage of 90% of the area should be achieved at the end of the period for establishment works. The vegetation should be healthy and free from weeds. Areas that are considered unsatisfactory by the Engineer should be reseeded by hydroseeding as stated in General Specification.

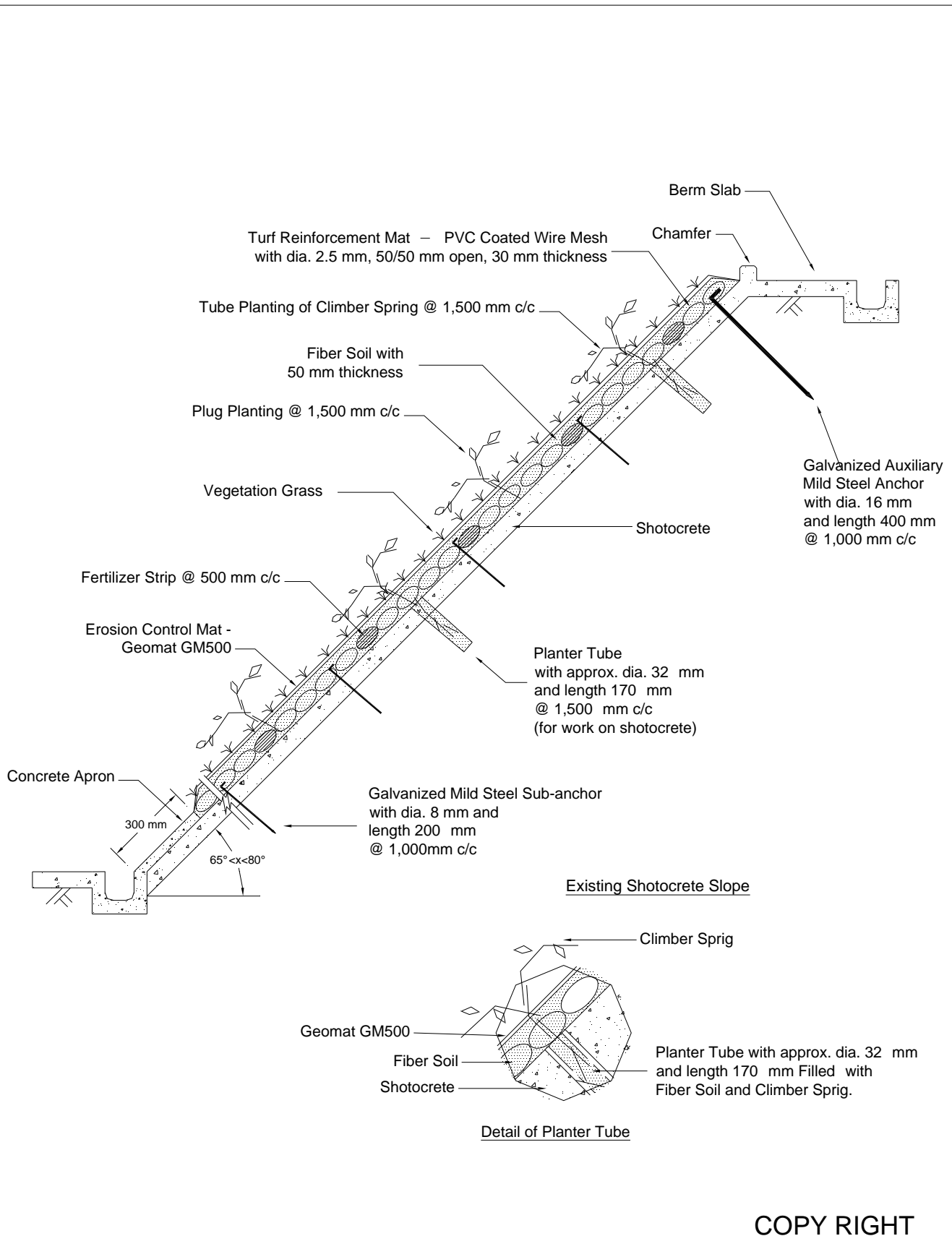
Watering 5.04 (1) Fresh water should be used for watering for Toyo-Mulching System. Water should be applied by using a hose or any type of sprinkler agreed by the Engineer and in such a manner that compaction, washout of loosening material will not be caused; any damage caused should be made good immediately.

		(2)	After spraying, watering should be carried out every 7 days. The minimum requirement for watering should be 10 litres/m ² . The Contractor may apply for the Engineer's agreement for relaxation of the requirements in the event of rainfall more than 10mm is recorded in the past 7 days.
		(3)	Watering should be conducted until the vegetation is satisfactorily established.
Grass Cutting	5.05	(1)	The inspection of grass cutting should be carried out twice a year at 5th month and 11th month after completion of work.
		(2)	Grass should be trimmed along the boundary of hydromulched area, if the creeper spread outside boundary of the hydromulched area more than 500 mm.
		(3)	Grass shall be reduced by cutting to a height of 100mm when it reaches 300 mm height.
Control of Pests and Fungi	5.06		Pesticide or fungicide should be applied in accordance with the manufacturer's recommendations to control pests and fungi.
Completion of Work	5.07		Immediately before the end of the period for establishment works: <ul style="list-style-type: none"> (a) All planted and grassed areas should be free from litter; (b) All replacement and patching up of vegetation should be completed; (c) All vegetation edges should be trimmed.


TESTING OF VEGETATION COVERAGE

Testing of Vegetation Coverage	6.01	(1)	Tests should be carried out to determine the vegetation coverage. The tests should be carried out 100 days after grassing and at the end of the period for establishment works. The vegetation should be cut to a height of 300 mm if necessary over the parts of the area to be tested.
		(2)	The number of tests should be instructed by the Engineer
		(3)	Tests should be carried out at location that is chosen by the Engineer to represent the grassed area as a whole. At each test location an approximate area of 10 m ² should be marked.
Compliance Criteria of	6.02		At least 90% of each test area should be covered with vegetation unless the

Vegetation Coverage		existing gradient of the slope is greater than that from design, or it is a shaded area that is not suitable for vegetation growth.
Non-compliance of Vegetation Coverage	6.03	If the result of any test for vegetation coverage of Toyo-Mulching System does not comply with the specified requirements for vegetation coverage, the area should be reseeded, by hydroseeding as stated in General Specification, depending upon the size of the defective area, as instructed by the Engineer.



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Project :	 Toyo Greenland Co., Ltd.	
Drawing Title : Section Detail of Toyo-Mulching System		
	Check : Ho Tat Pui, Daniel	Scale : N.T.S.
	Ref.:	Date: 20 January 2005

