

Specification for Revetment Repair Works

**River Ebbw,
Rogerstone Welfare Grounds,
Tregwilym Road,
Rogerstone,
Newport
NP10 9NH**

**Prepared for:
Rogerstone Community Council
Ref:17957 -04
October 2024**

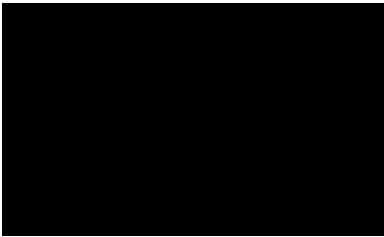


Vale Consultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS

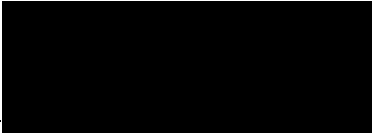
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1.0 General

1.1 Scope

This section covers the requirements for:

- (i) Aqua Rock Bags filled with stone and for the filter cloth on which they may be laid.
- (ii) Filling Aggregate Stone
- (iii) Pre-Filled Rock Rolls
- (iv) Earthworks
- (v) Landscaping
- (vi) Rock Mattress

1.2 Preparation of Formations

The Contractor shall prepare the formation prior to the placement of the rock bags by trimming the face of the existing embankment to remove any loose debris, with the minimum of cut and material loss for what is a fairly stable face to the existing embankment. When over-excavation occurs, it shall be backfilled with compacted gravel backing to the approval of the Engineer at the expense of the Contractor.

Where filter cloth is to be laid on the formation, all sharp projections caused by rocks, roots, etc., shall be removed and the voids so formed shall be filled with compacted gravel. The surface of the formation shall be smooth and even.

1.3 Gravel Backing and Filter

Gravel backing and filter cloth where required and under the direction of the engineer shall consist of approved clean, hard natural gravel or broken stone well graded from 50mm to 10mm and shall be laid to the thickness specified to give an even surface parallel to the face of the bank protection. Gravel backing shall be laid to provide bank protection as specified.

1.4 Method of Construction

The rock bags are typically filled at the job site using a portable filling frame and excavator. Rock bags shall be positioned such that the weight in a bag does not exceed 2.0t, volume 1.25 m³, rock bag filled dimension 1900mm dia x 500 mm ht. Adjoining rock bags shall be firmly wired together to give a continuous joint along all adjacent edges using 6mm UV-stabilised polypropylene twisted rope. The base line of rock bags to be anchored into the river gravels with specified anchors (1 No /bag) and where rock bags are placed on filter cloth care shall be taken to avoid puncturing the cloth during erection.

Installation of rock bags to be offloaded and site filled within the assigned lay down area on the Jubilee Park side of the flood defence wall and positioned using an excavator (or slewing crane) **Ref Fig 1** with the necessary lifting capacity and sufficient room for the boom to rotate locate on the Jubilee Park side of the flood defence wall and a quick hitch that is fixed to the lifting eye of the rock bag.

Sizes of rock bags shall be as shown on the drawings.



Fig 1

1.5 Filter Cloths

The filter cloth shall be a “welded” non-woven material to the approval of the Engineer. The filter cloth shall be resistant to chemical and biological degradation from all naturally occurring minerals and bacteria. The filter cloth shall be permeable and capable of passing a 40 l/m²/s at 100mm head of water with a uniform pore size distribution from 0.02 to .015mm. The filter cloth material shall have a minimum tensile strength of 1.7 kN/200mm and a minimum grab tensile strength of 0.85 kN when tested in accordance with ASTM Standard D1682 with a 200mm sample width.

The filter cloth shall be laid on a prepared formation or in a prepared trench and shall be overlapped at joints by not less than 0.5m and shall be laid strictly in accordance with the recommendations of the manufacturer.

1.6 Aqua Rock Bags

The Aqua rock bags shall be as specified in Section 4.0 which is high strength, UV-resistant, HDPE material.

Fig 2 (Specialist supply Salix, Croxton Park, Thetford, Norfolk. IP24 1LS. Tel 0330 002 1788)

1.7 Stone for Aqua Rock Bags

The filling aggregate stone used for rock bags shall be clean, natural, hard and durable with a minimum density of 2 650 kg/m³, Ref: HW Specification Table 6/1, Class 6G.180mm-50 mm stone size (1m³ =1.7tonne of stone) A tonne aggregate shall be hard, sound, broken granite or equivalent hard rock obtained from an approved source, and shall be free from cracks, kaolinised patches, organic or other impurities. Sand and dust shall not exceed 1% by weight. Rock fragments used for bag filling shall be angular and the greater dimension of any piece shall not exceed twice the least dimension. Stones shall be graded as specified on the drawings. The specific gravity of the rock shall not be less than 2.60.



Fig 2

1.8 Pre-Filled Rock Roll Mattress (*Specialist supply Salix, Croxton Park, Thetford, Norfolk. IP24 1LS. Tel 0330 002 1788*)

Pre-filled tubular rock roll mattress typically created from multiple rock rolls single 1.6m in length with a diameter of 400 mm pre-stitched together. Fig 3

- **Net Specification**

Net material: 3 mm synthetic HDPE braided knotted nets; UV treated.

Net aperture: 32 mm

Net yarn thickness: 3 mm

Single mesh tensile strength: 152.4 kg = 1.49 kN/ mesh

- **Stone Specification**

Frost-resistant granite or limestone subject to availability

Typically, 40–80 mm

Semi-angular stone unit

- **Design Life**

Virgin HDPE has an expected design life of up to 100 years

- **Rock Rolls Aggregates**

Rock Rolls and Rock Mattresses prefilled.

- **Performance**

Maximum permissible flow velocity: 5 m/s dependent on suitable fixings

Benchmark testing in clean laminar flow flume trial identified 8 m/s

Maximum wave height: 1 m Maximum shear stress: 1200 N/m



Fig 3: Typical Detail of Rock Roll

1.9 Rock Mattress (*Specialist supply Salix, Croxton Park, Thetford, Norfolk. IP24 1LS. Tel 0330 002 1788*)

Pre-filled rock mattress to be placed and fixed to the face of the existing stone slope adjacent the downstream face of the bridge abutment: For location Ref Drg 17597:501-r05

Rock Mattresses



Key Delivery Notes

- As standard will arrive bundled with strops on an articulated flat-bed lorry
- Suitable mechanical plant is required for offloading
- Any lifting strops returned undamaged within 2 months of delivery will be refunded at £1 per strop.*
- Edge protection is provided as standard on all flatbed vehicle deliveries
- Lifting chains are required for offloading and installation (not supplied)

Measurements

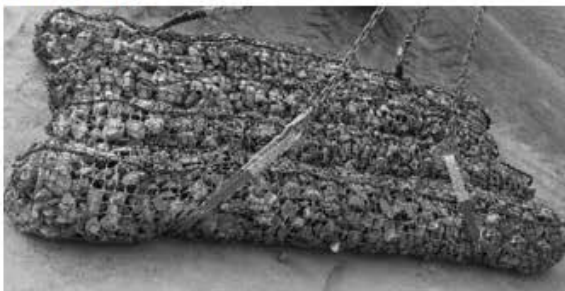
Size	Weight
2m x 1m x 0.25m	510kg (+/- 15%)
2m x 0.9m x 0.3m	640kg (+/- 15%)
2m x 2m x 0.25m	on demand
2m x 1.8m x 0.3m	on demand

* Return delivery address is: Salix, The Hayloft, Blakenhall Park, Bar Lane, Barton-Under-Needwood, Staffs DE13 8AJ

Delivery and Unloading Instructions

Option 1 - Individually stacked

Each mattress is supplied with 2 lifting strops. This option requires a person to access the bed of the lorry. Suitable mechanical plant will be required for offloading.



Option 1 - individually stacked

Option 2 - Palletised

1nr mattress per 2m x 1m pallet. Suitable mechanical plant will be required for offloading.



Option 2 - arriving on pallets

Installation Instructions

1. Mattresses are installed using the lifting strops provided.



2. The mattress must be laid onto a smooth profile so that there is full contact and no voids. In some instances placing a separation geotextile may be necessary before installing the mattress. The mattress is flexible and will conform to the prepared profile. All obstructions (stones, tree roots etc.) over 50mm should be cleared.

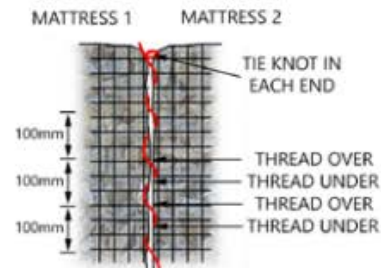


3. Where laid on a slope that is steeper than 1:2 suitable fixings may be required to retain it in position.

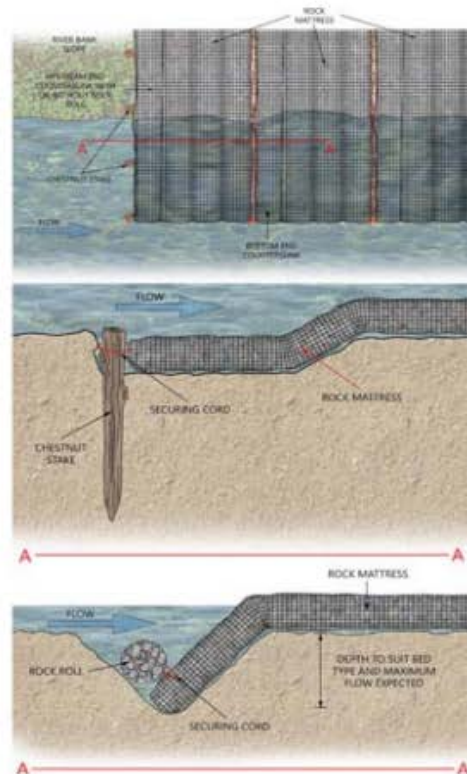
Post installation

Water flow is slowed as it passes over the surface of the mattress, and the sediment trapped between the rocks allows plants to colonise. Where required, seeds and soils can be spread over mattress that is out of the water to speed up vegetation establishment.

4. Once in position all units are to be hand stitched together at 100mm centres with polypropylene twine or cable ties of a suitable strength and longevity.



5. When used in flowing water applications, ensure that the leading edges are countersunk or trenched to direct the flow over the mattress surface.



6. Lifting strops need to be removed once installed.

Please note these are generic installation guides, if you have site specific issues please contact Salix

2.0 Earthworks

2.1 Site Conditions

A geotechnical desk study and site investigations have been carried out. The results presented in the Site Investigations have been completed. The results are summarised in the following reports which are included in the tender documents

The engineering works may only be undertaken using suitable material (discussed below). This material will be sourced from off-site suppliers

The Contractor shall read the reports, visit the site and thoroughly familiarise himself with the surface and subsurface conditions

The site location is shown on drawing ref 17957-100-r01 and original ground levels are shown on the Existing Levels Survey, drawing ref 17957-101-r01. The profiles are shown in the cross-section plan drawing No. 17957-502-r02, 17957-503-r02 and the proposed works are shown on drawing ref 17957-504-r02

2.2 Outline Specification

All works should be implemented in general accordance with BS 6031:2009 'Code of Practice for Earthworks

Suitable Materials, Placement and Compaction Suitable materials must meet the requirements of the following fill materials classified in the Specification for Highway Works (2005):

- General Granular Fill (Class 1a – 1c).
- General Cohesive Fill (Class 2a – 2e).
- Landscape Fill (Class 4).
- Selected Granular Fill (Class 6F2, 6F5, 6H ,6N).

These classes cover a full grading range. Oversize material (max 250mm diameter) will be permitted within the fill so long as they do not comprise more than 20% of the total by weight.

Fills must be placed at a suitable moisture content, in layers of maximum 500mm thickness and each layer compacted with a minimum 4-passes of a 12-tonne tracked excavator, or suitable vibratory roller, before the next layer is placed.

This material should be compacted to a minimum of 90% maximum dry density, with a minimum undrained strength of remolded material 50kN/m². No frozen fill is to be placed.

Fill to the structures shall be in accordance with Specification for Highway Works cl 610

2.3 Formations and Sub-formations

Protection

Construction plants and other vehicular traffic shall not be operated on the sub-formation, except for that required for preparation of the sub-formation, unless adequate protection is provided. The Contractor's proposals for preparing the sub-formation and how he intends to traffic it shall be agreed with the engineer.

If any areas of sub-formation are damaged by the weather or any other cause the engineer shall be immediately notified. The Contractor shall submit proposals for remedial works.

The Contractor shall not allow any sub-formation to be left exposed for more than 4 hours after being uncovered

2.4 Methodology

Waste Reception and Handling Procedures

Guidance will be given by the site operator to all employees, sub-contractors, other waste carriers and customers regarding the waste types which are acceptable, i.e. clays, subsoils and hardcore.

For the protection of the operator and site supervisor any loads containing soil from development near an industrial site/area must be accompanied by written documentation to demonstrate that the soil is not contaminated, i.e.

- A site investigation report, including borehole logs (if available).
- Waste analyses (if available), including leachability tests.
- Name and address of the site from which the waste was excavated/produced.
- Detailed waste description, including EWC code and transfer note.

The operator reserves the right to refuse such loads and contact the Environment Agency where necessary (prior to acceptance of the loads) to ensure that the load is acceptable. All incoming vehicles are required to report to the operator's representative upon arrival at the site. The details of the load will be recorded, and the duty of care note/company documentation will be further checked by the operator to ensure that the load is acceptable at the site, including a visual check prior to the vehicle proceeding to the tipping area. Any deviation from the procedures or problems with any loads will result in tipping facilities being suspended for the offending company. Loads which are not acceptable within the above terms will be rejected. If the load is acceptable the driver will be instructed to deposit it in the current working area. If the load is unacceptable after visual inspection, it will be rejected and dismissed from the site.

2.5 Material Testing

- Chemical analysis

All permitted waste will be accompanied by waste analysis including leachability results where available prior to depositing on site.

- Classification testing

Classification testing will be carried out for each source of material in accordance with BS1377. This will enable the engineer to refer to the Highways 600 Compaction Requirements table 6/1 (11/05) for the given material class.

All testing results will be collated and available in the Project file.

- Record keeping

The following details will be recorded for every load deposited at the site:

- (i) The date and time of delivery.
- (ii) The name and address of the waste producer.
- (iii) The type and quantity of waste (in tonnes or cubic meters).
- (iv) The carrier's name/driver name
- (v) Vehicle registration No.

(vi) Signature of person inspecting the waste

A summary of the quantity of waste deposited at the site will be retained for inspection by the engineer and the NRW as required and for submission of the quarterly environmental returns.

2.6 Table 6/1: Requirements for Acceptability and Testing etc. of Earthworks Materials

Acceptable limit for the files in Table 6/1 appropriate to the Contract [Table 6/1, 602. 1 and 608.1] and including: Amendments to Table 6/1:

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)		
				Property (See Exceptions in Previous Column)	Acceptable Limits Within:	
					Lower	Upper
1A	Well graded granular material	General Fill	As table 6/1.	(iii) mc	4% below optimum	2% above optimum
				(iv) MCV	-	-
1B	Uniformly graded granular material	General Fill		(iii) mc	4% below optimum	2% above optimum
				(iv) MCV	-	-
1C	Coarse granular material	General Fill		As table 6/1	As table 6/1	As table 6/1
4	Various	Fill to landscape areas	Refer to the architect's specification			
5A	Topsoil	Soft Landscaping	Refer to the architect's specification			
6A	Selected well graded granular material	Fill placed below water	As table 6/1.	As table 6/1	As table 6/1	As table 6/1
6F1	Selected granular material (fine grading)	Capping		As table 6/1	As table 6/1	As table 6/1
6F2	Selected granular material (coarse grading)	Capping		As table 6/1	As table 6/1	As table 6/1
6H	Selected granular material	Drainage layer below the B2 slab	NOT slag, chalk or colliery spoil. Otherwise as table 6/1.	(iv) mc	4% below optimum	2% above optimum
				(v) MCV	-	-
6I & 6J	Selected well graded granular material	Fill to reinforced soil structures	Well burnt colliery slag shall not be used. Chalk	Mc	4% OMC	2% OMC
				MCV	N/A	N/A
				Effective angle of friction (Φ')	35o	As Table 6/1

			shall not be used. Otherwise as table 6/1	Effective cohesion (c')	0	As Table 6/1
				Coefficient of friction	N/A	As Table 6/1
				Coefficient of adhesion	N/A	As Table 6/1
6N	Selected well graded granular material	Fill to structures	As table 6/1.	(iv) undrained shear parameters (c and ϕ)	-	-
				(v) effective angle of internal friction (Φ') and effective cohesion (c')	$\Phi' = 35^\circ$	As table 6/1
				(vi) permeability	10^{-3} m/s	As table 6/1
				(vii) mc	4% below optimum	2% above optimum
				(viii) MCV	-	-
				(ix) slope stability test (Where required in App 6/6)	Slope stability test is not required	
6P	Selected granular material	Fill to structures	As table 6/1.	(iv) undrained shear parameters (c and Φ)	-	-
				(v) effective angle of internal friction (Φ') and effective cohesion (c')	$\Phi' = 35^\circ$	As table 6/1
				(vi) permeability	10^{-3} m/s	As table 6/1
				(vii) mc	4% below optimum	2% above optimum
				(viii) MCV	-	-
				(ix) slope stability test (Where required in App 6/6)	Slope stability test is not required	

3.0 Landscaping

3.1 Vmax C350 Turf Reinforced Mat

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between super heavy-duty UV stabilized nettings with 1.27 x 1.27 cm openings, an ultra-heavy UV stabilised, dramatically corrugated (crimped) intermediate netting with 1.27 x 1.27 cm openings, and covered by a super heavy-duty UV stabilized nettings with 1.27 x 1.27 cm openings. The middle-corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 3.81 cm centres with UV stabilised polypropylene thread to form permanent three-dimensional turf

reinforcement matting. All mats shall be manufactured with colored thread stitched along both outer edges as an overlap guide for adjacent mats.

1.10 3.2 Material Specification Vmax C350 Turf Reinforced Mat (Specialist supply Salix, Croxton Park, Thetford, Norfolk. IP24 1LS. Tel 0330 002 1788)



**Material and Performance
specification**

VMax C350 Composite Turf Reinforcement Mat (C-TRM)

Description		
The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between super heavy duty UV stabilized nettings with 1.27 x 1.27 cm openings, an ultra-heavy UV stabilised, dramatically corrugated (crimped) intermediate netting with 1.27 x 1.27 cm openings, and covered by an super heavy duty UV stabilized nettings with 1.27 x 1.27 cm openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 3.81 cm centres with UV stabilised polypropylene thread to form permanent three-dimensional turf reinforcement matting. All mats shall be manufactured with colored thread stitched along both outer edges as an overlap guide for adjacent mats.		
The C350 shall meet Type 5A, B, and C specification requirements established by the Erosion Control Technology Council (ECTC) and Federal Highway Administration's (FHWA) FP-03 Section 713.18		
Material Content		
Matrix	100% Coconut Fibre	0.27 kg/m ²
Netting	Top and Bottom, UV stabilized Polypropylene	3.91 kg/100m ²
	Middle, Corrugated UV stabilized Polypropylene	11.7 kg/100m ²
Thread	Polypropylene, UV stable	
Standard Roll Sizes		
Width	2.0 m	
Length	20.0 m	
Weight ± 10%	23 kg	
Thread	40 m ²	
Bench Scale Testing (NTPEP)		
Test Method	Parameters	Results
ASTM D7101	50 mm /hr-30 min 100mm /hr-30 min 150mm /hr-30 min	SLR** = 11.84 SLR** = 19.54 SLR** = 32.26
ASTM D7207	Shear at 12.7 mm soil loss	326 Pa
ASTM D7322	Top Soil, Fescue, 21 day incubation	380% improvement of biomass
* Bench scale tests should not be used for design purposes ** Soil Loss Ratio = Soil Loss Bare Soil/Soil Loss with RECP		

Index Property	Test Method	Typical	
Thickness	ASTM D6525	18.54 mm	
Resiliency	ASTM 6524	90%	
Density	ASTM D792	0.917 g/cm ³	
Mass/Unit Area	ASTM 6566	624 g/m ²	
UV Stability	ASTM D4355 /1000 hr	86%	
Porosity	ECTC Guidelines	99%	
Stiffness	ASTM D1388	275990 mg-cm	
Light Penetration	ASTM D6567	7.2%	
Tensile Strength - MD	ASTM D6818	8.70 kN/m	
Elongation - MD	ASTM D6818	45.3%	
Tensile Strength - TD	ASTM D6818	10.20 kN/m	
Elongation - TD	ASTM D6818	19.5%	
Maximum Permissible Shear Stress			
	Short Duration	Long Duration	
Phase 1 Unvegetated	153 Pa	144 Pa	
Phase 2 Partially Veg.	480 Pa	480 Pa	
Phase 3 Fully Veg.	576 Pa	480 Pa	
Unvegetated Velocity	3.2 m/s		
Vegetated Velocity	6.0 m/s		
NTPEP ASTM D6460 Large Scale Channel			
Unvegetated Shear Stress	153 Pa		
Unvegetated	3.45 m/s		
Slope Design Data - C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 6 m	0.0005	0.015	0.043
6-15 m	0.018	0.031	0.050
≥ 15 m	0.035	0.047	0.057
Roughness Coefficients - Unvegetated			
Flow Depth	Manning's n		
≤ 0.15 m	0.041		
0.15 – 0.60 m	0.040-0.013		
≥ 0.60 m	0.012		

Rolled Erosion Control Product (RECP)

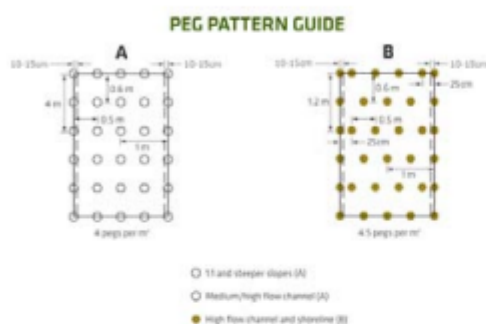


Fig 1

Slope Installation

Please note the slope installation guide outlines our general recommendations for installing Salix's temporary and/or permanent RECPs on sloping applications.

1. **Soil preparation** - Create a smooth surface removing any clods, debris or foot imprints in the soil to ensure full mat to ground contact when rolled out. This will ensure that young grass grows through the mat and does not get trapped underneath. No soil is placed on top of the matting after installation.
2. **Seeding** - Seed the prepared soil before rolling out RECP
3. **Anchor trench** - Create an anchor trench around whole perimeter approximately 15cm deep x 15cm wide. Begin installation by unrolling the RECP 30cm beyond the top edge of the anchor trench. Anchor the RECP with a row of pegs approximately 30cm apart in the bottom of the trench. Backfill and compact the trench after pegging. Apply seed to the compacted soil and fold the remaining 30cm portion of RECP back over the seed and compacted soil. Secure RECP over compacted soil with a row of pegs

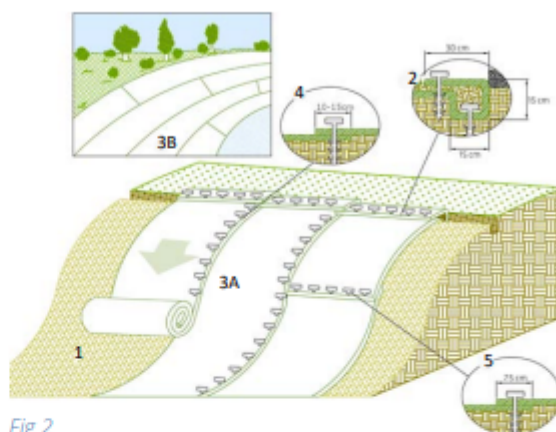


Fig 2

spaced approximately 30 cm apart across the width of the RECP (Fig 2-2).

4. Roll the RECP (*Fig 2-3A*) down or (*Fig 2-3B*) horizontally across the slope. RECPs will unroll with the correct side against the soil surface. All RECPs must be securely pegged to the soil surface by placing pegs in appropriate locations as shown in the peg pattern guide above (*Fig 1*).
5. The edges of parallel RECP rolls must be pegged with a 10-15cm overlap (*Fig 2-4*).
6. Consecutive RECP lengths joined down the slope must be overlapped end-over-end (shingle style) with an approximate 7.5cm overlap (*Fig 2-5*). Peg through overlapped area, approximately 30cm apart across entire RECP width.

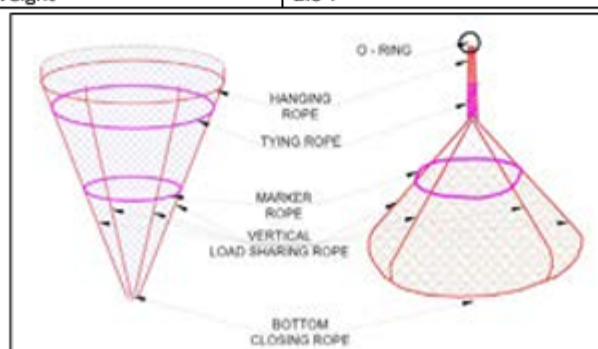
*Note: In adverse soil conditions longer pegs/ stakes or earth anchors may be necessary to properly secure the RECP.

4.0 Aqua Roack Bags Comprehensive Technical Data Sheets

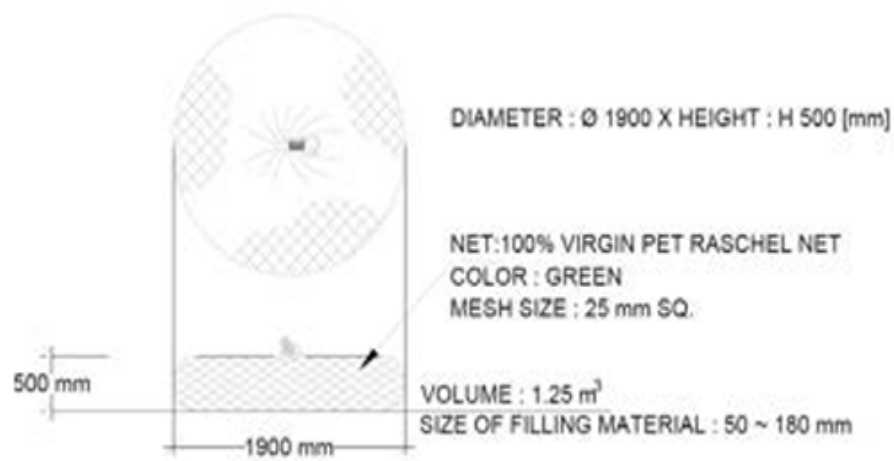
Data Sheet for 2T Bags

Data Sheet

Specifications	Filled Dimensions	1.9 m (D) x 0.5 m (H)
	Form	Bag Form with Double Layer Net
	Net Material	Virgin PET (Green)
	Net Composition	1000 D x 18 ply knotless
	Mesh Size	25 mm square mesh
	Hanging Rope	10 mm Polyester Twisted 3Strand Black Rope
	Tying Rope	6 mm Polyester Twisted 3Strand Black Rope
	Marker Rope	12 x 3 PPMF White Twine
	Vertical Load Sharing Rope	6 mm Polyester Twisted 3Strand Black Rope
	Bottom Closing Rope	10 mm Polyester Twisted 3Strand Black Rope
Strength Characteristics	Net	Tensile Strength: As per EN ISO 10319 / ASTM D4595 MD: >25 kN/m CMD: >8.5 kN/m Elongation: As per EN ISO 10319 / ASTM D4595 MD and CMD: >15 % and >75% respectively
	Hanging Rope	10 mm Polyester Twisted 3Strand Black Rope Tensile Strength: > 14.4 kN Elongation: > 10 %
	Tying Rope	6 mm Polyester Twisted 3Strand Black Rope Tensile Strength: > 5.4 kN Elongation: > 10 %
	Vertical Load Sharing Rope	6 mm Polyester Twisted 3Strand Black Rope Tensile Strength: > 5.4 kN Elongation: > 10 %
	Bottom Closing Rope	10 mm Polyester Twisted 3Strand Black Rope Tensile Strength: > 14.4 kN Elongation: > 10 %
	O-Ring	Working Load: 19.6 kN Breaking Strength: >78.4 kN
Filling	Fill Aggregates	Rounded to Sub-Rounded Cobbles, Pebbles and Boulders (50 mm – 180 mm)
	Volume	1.25 m ³
	Weight	2.0 T



Dimension of 2T filled AquaRock Bag



Bag Structure before Filling

