

# TENAX 'TT' MONO-ORIENTED HDPE GEOGRID

## TENAX TT SAMP

Type: **045 - 060 - 090 - 120 - 160**

Mono-oriented geogrids



TENAX **TT SAMP** are mono-oriented geogrids especially designed for soil reinforcement. TENAX **TT SAMP** geogrids are manufactured with a unique extrusion technology using high quality polymers. TENAX **TT SAMP** geogrids have high tensile modulus, great interlock capacity and junction strength, as well as superior long term design strength and durability.

### Typical applications

Retaining walls; steep slopes reinforcement; landslides repair; embankments stabilization; landfill side slopes reinforcement.

PHYSICAL CHARACTERISTICS	TEST METHOD	UNIT	DATA	NOTES
STRUCTURE			MONO-ORIENTED GEOGRIDS	
MESH TYPE			OVAL APERTURES	
STANDARD COLOR			BLACK	
POLYMER TYPE			HDPE	
U.V. STABILIZER			CARBON BLACK	
PACKAGING			ROLLS WITH IDENTIFICATION LABEL	

DIMENSIONAL CHARACTERISTICS	TEST METHOD	UNIT	TT 045 SAMP	TT 060 SAMP	TT 090 SAMP	TT 120 SAMP	TT 160 SAMP	NOTES
APERTURE SIZE MD		mm	220	220	220	220	220	b,d
APERTURE SIZE TD		mm	13/20	13/20	13/20	13/20	13/20	b,d
ROLL WIDTH		m	1.0	1.0	1.0	1.0	1.0	b
ROLL LENGTH		m	100.0	75.0	50.0	30.0	30.0	b
ROLL DIAMETER		m	0.35	0.35	0.37	0.35	0.40	b
ROLL VOLUME		m <sup>3</sup>	0.13	0.12	0.14	0.12	0.16	b
GROSS ROLL WEIGHT		kg	30.0	30.0	30.0	24.0	30.0	b

TECHNICAL CHARACTERISTICS	TEST METHOD	UNIT	TT 045 SAMP	TT 060 SAMP	TT 090 SAMP	TT 120 SAMP	TT 160 SAMP	NOTES
STRENGTH AT 2% STRAIN	ISO 10319	kN/m	11.0	17.0	26.0	36.0	45.0	a,c
STRENGTH AT 5% STRAIN	ISO 10319	kN/m	25.0	32.0	50.0	72.0	90.0	a,c
PEAK TENSILE STRENGTH	ISO 10319	kN/m	45.0	60.0	90.0	120.0	160.0	a,c
YIELD POINT ELONGATION	ISO 10319	%	11.5	13.0	13.0	13.0	13.0	b,c
JUNCTION STRENGTH	GRI-GG2	kN/m	36.0	50.0	80.0	110.0	130.0	b
LONG TERM DESIGN STRENGTH	ISO 13431	kN/m	21.2	28.3	42.4	56.5	75.4	a,e

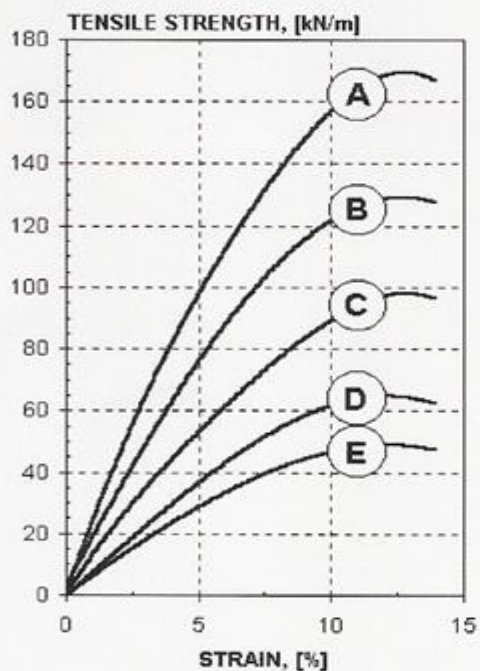
#### NOTES:

- 95% lower confidence limit values, ISO 2602
- Typical values
- Tests performed using extensometers at 100 mm/min at 20°C
- MD : machine direction (longitudinal to the roll)  
TD : transverse direction (across roll width)
- Design strength based upon 120 years design life at 20°C and fill soil up to 40 mm size

**TENAX**<sup>®</sup>  
Man, Technology, Environment.

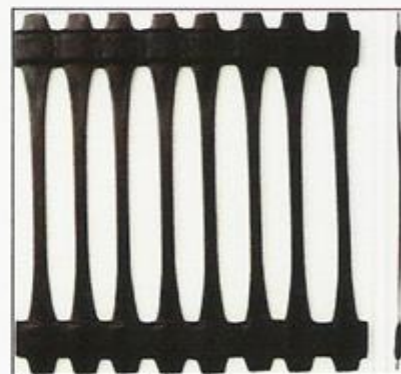
GE0 41.10 - E - 05/07

## TENAX TT SAMP



### GEOGRID TYPE:

- A = TENAX TT 160 SAMP
- B = TENAX TT 120 SAMP
- C = TENAX TT 090 SAMP
- D = TENAX TT 060 SAMP
- E = TENAX TT 045 SAMP



### Typical Tensile Characteristics



0799-CPD-25



The TENAX Laboratory has been created in 1980 and has been continuously improved with the purpose of assuring unequalled technical development of the products and accurate Quality Control.

The TENAX Laboratory can perform mechanical, hydraulic and durability tests, according to the most important international standards like ISO, CEN, ASTM, DIN, BSI, UNI.

#### TENAX SpA

##### Geosynthetics Division

Via dell'Industria, 3  
I-23897 Viganò (LC) ITALY  
Tel. (+39) 039.9219307  
Fax (+39) 039.9219200  
e-mail: [geo.div@tenax.net](mailto:geo.div@tenax.net)  
Web Site: [www.tenax.net](http://www.tenax.net)

#### TENAX International B.V.

##### Geosynthetics Division

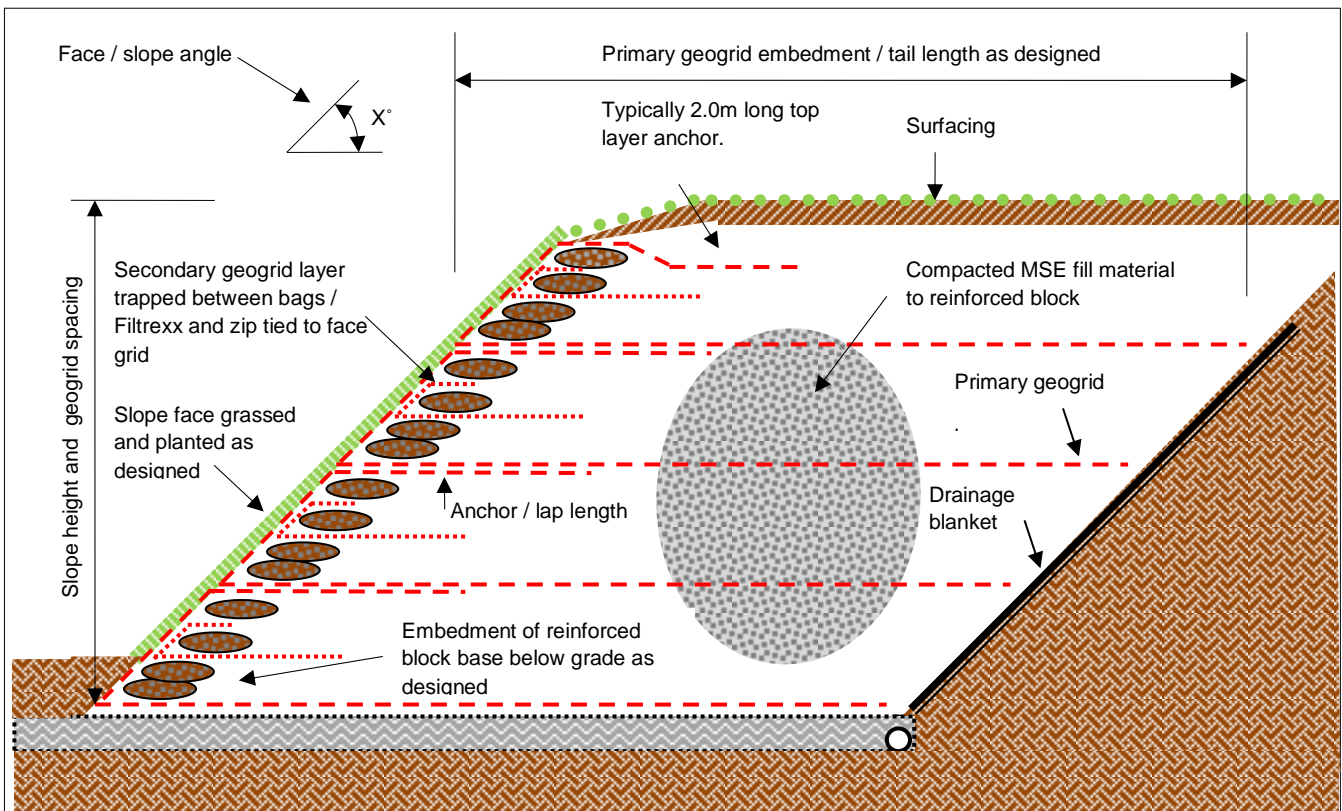
Via Ferruccio Pelli, 14  
CH-6900 Lugano SWITZERLAND  
Tel. (+41) 091.9242485  
Fax (+41) 091.9242489  
e-mail: [geo@tenax.ch](mailto:geo@tenax.ch)  
Web Site: [www.tenax.net](http://www.tenax.net)

**TENAX®**  
Man, Technology, Environment.








## TENAX 'TT' WRAP FACE MSE WALL DETAILS

### MECHANICALLY STABILISED EARTH (MSE) EMBANKMENTS AND SLOPES WRAPPED FACE CONSTRUCTION SEQUENCE



**SKETCH 'A' DIAGRAMMATIC CROSS SECTION THRU WRAPPED FACE MSE EMBANKMENT / SLOPE**

- Primary geogrid wrapped up face of sacks and returned / lapped with next layer, lap typically 1500mm
- ..... Secondary geogrid placed ½ way between primary geogrid layers, typically 300mm crs. with 1000mm anchor length
-  Hessian bag / Filtrexx tube filled with MSE fill material / aggregate + loam, grass seed & slow release fertilizer mix
-  Aggregate drainage blanket typically 300mm thick wrapped with TerraTex 160N geotextile
-  Subsoil collector pipe to dewater drainage blanket, either Atlantis strip drain system or TerraDrain strip drain
-  Face planting as required
-  Tenax Tendrain 750/2 geocomposite drainage blanket

#### STEP 1 Foundations

Prepare the foundation and base drainage system.

#### STEP 2 Hessian Sacks / Filtrexx Tube

Hessian bags / Filtrexx tube typically filled with the MSE fill material plus fertilizer, typically bags filled to give a 150mm lift when placed and compacted.

Hessian bag ends typically closed by either sewing or folded over flap.

#### STEP 3 Placement Of First Layer Of Primary Geogrid

Roll out first layer of primary geogrid at **right angles** to the slope face with 0 to 50mm side lap to adjacent geogrid runs

Cut geogrid pieces to required length ie; embedment / tail length + face slope length + anchor length

Anchor geogrid at the slope face with a layer of the filled hessian sacks laid stretcher bond (like bricks) or the Filtrexx tube to the correct line, level and face angle.

Tension the geogrid by hand in both directions to remove all folds and wrinkles, at the free end anchor with ground staples or weight with MSE fill material

**Do not roll out the geogrid parallel to the slope face**



#### STEP 4 Placement Of MSE Fill Material

Complete the placement of the hessian bags / Filtrexx tube to the underside of any secondary geogrid and check for correct alignment for both face angle and line / level.

Correct placement as required by 'patting / pushing on' the face of the slope with the underside of an excavator bucket

Place and compact the MSE fill material maintaining a minimum of 150mm cover to the geogrid.

**Do not** drive directly over onto the exposed geogrid with wheeled or tracked vehicles .

**Do not** push the MSE fill material out across the exposed geogrid, cascade the fill material onto and over the exposed geogrid.

Compact the MSE fill material to the required standard and build up in lifts typically 150 to 200mm thick

Use only light hand / pedestrian operated compaction equipment within 1.0m of the slope face, correct the alignment of any displaced hessian bags / Filtrexx tubes

#### STEP 5 Placement Of Secondary Geogrid Layer

Trap the geogrid between hessian bag / Filtrexx tube layers, typically at 300mm to 400mm centres maximum with 300mm side lap to adjacent geogrid runs

#### STEP 6 Placement Of MSE Fill Material

Complete the placement of the hessian bags / Filtrexx tubes to the underside of the next layer of geogrid

Place and compact the MSE fill material as in step 4 above

Place and wrap the primary geogrid up and over the hessian sacks and tension the anchor / lap length.

#### STEP 7 Placement Of Subsequent Primary Geogrid Layers

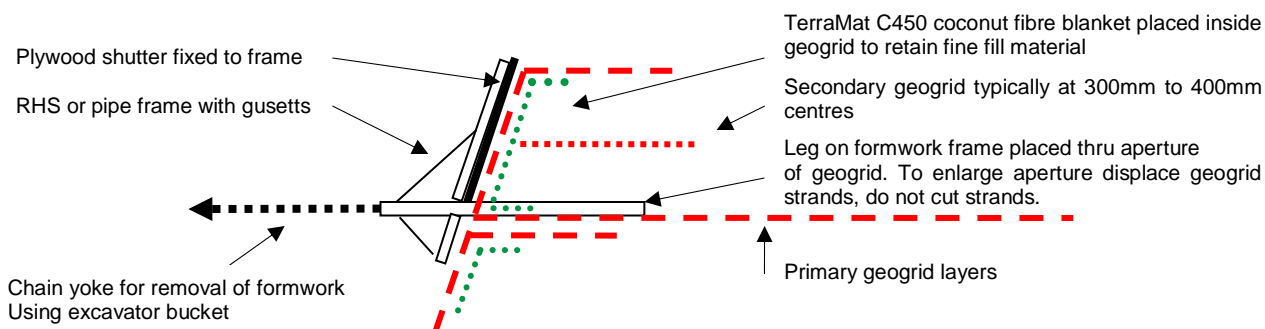
Roll out, cut to length, place, lap and tension the geogrid as in step 3 above.

#### Step 8 Construct The Embankment / Slope To Full Height

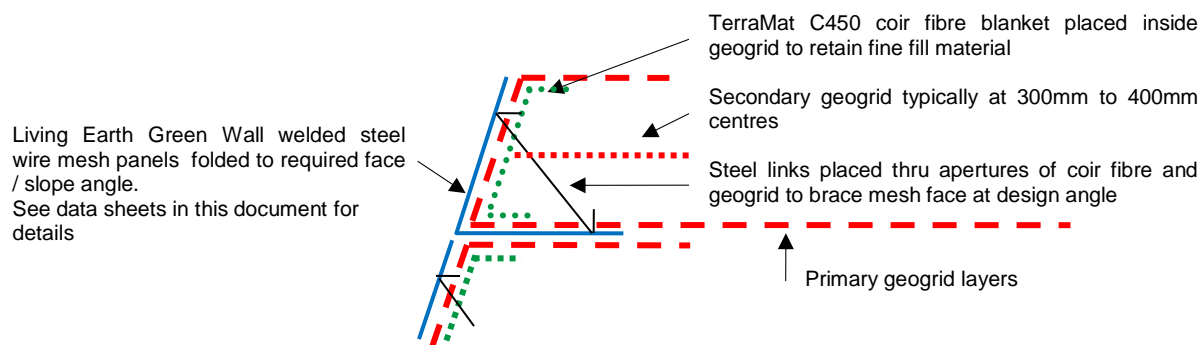
Repeat the above steps, 3 to 7 inclusive for the full height of the embankment / slope with the exception of the top layer anchor length, see diagrammatic sketch detailing anchor embedment length and profile.

#### THE FOLLOWING ITEMS CONSTRUCTED AS SPECIFIED / DESIGNED AND DETAILED IN THE CONTRACT DOCUMENTS.

- 1/ The contract documents take precedence over details and systems denoted in this document
- 2/ MSE slope foundation construction / bearing capacity / embedment depth below grade.
- 3/ MSE fill material type and compaction rate
- 4/ Primary geogrid strengths / grades
- 4/ Secondary geogrid strength / grade (if any required)
- 5/ Primary geogrid spacing and embedment / tail lengths
- 6/ Geogrid layer anchor lengths
- 7/ Slope / embankment face angle.
- 8/ Slope / embankment formwork and facing / planting system
- 9/ Drainage and drainage blanket construction



#### RE-USEABLE PLYWOOD SHUTTERS : ALTERNATIVE METHOD TO HESSIAN SACKS FOR FORMING FACE OF SLOPE



#### LIVING EARTH GREEN WALL STEEL MESH FACING / FORMWORK SYSTEM ALTERNATIVE METHOD TO HESSIAN SACKS FOR FORMING FACE OF SLOPE





## LIVING EARTH GREEN WALL™

WELDED STEEL MESH FACING COMBINED WITH GEOGRID REINFORCED SOILS



THE ABOVE PHOTOS ARE REPRESENTATIVE OF RECENT EUROPEAN PROJECTS CONSTRUCTED USING TENAX 'TT' HDPE GEOGRIDS AND HUESKER FORTRAC POLYESTER GEOGRIDS



## LIVING EARTH GREEN WALL FEATURES AND BENEFITS

Living Earth Green Wall panels are a steel mesh formwork / facing system that speeds the construction of MSE walls. The geogrid is the primary reinforcement of both the wall face and the reinforced block, ie; the wrap around system. The panel is a principally a construction aid but has other significant benefits.

- Has a low environmental impact when fully planted or grassed.
- Easily planted or seeded.
- Custom made in New Zealand.
- The panel bars can be configured as required.
- The panel lifts can be configured as required
- The panel method can be used on all wall heights
- The panel allows variable face angles up to 80°
- The panel has a low installed cost when compared with other systems and methods of construction.
- Simple and fast construction.
- The panel is principally a construction aid.
- The panel facing is non-structural, the geogrid reinf. is the primary structural element.
- Restricts vandalism to the wall face.
- Damage to the face geogrid and panel can be readily made good.
- Readily accommodates the construction of curved and benched walls.
- Walls design as per standard practice for MSE walls

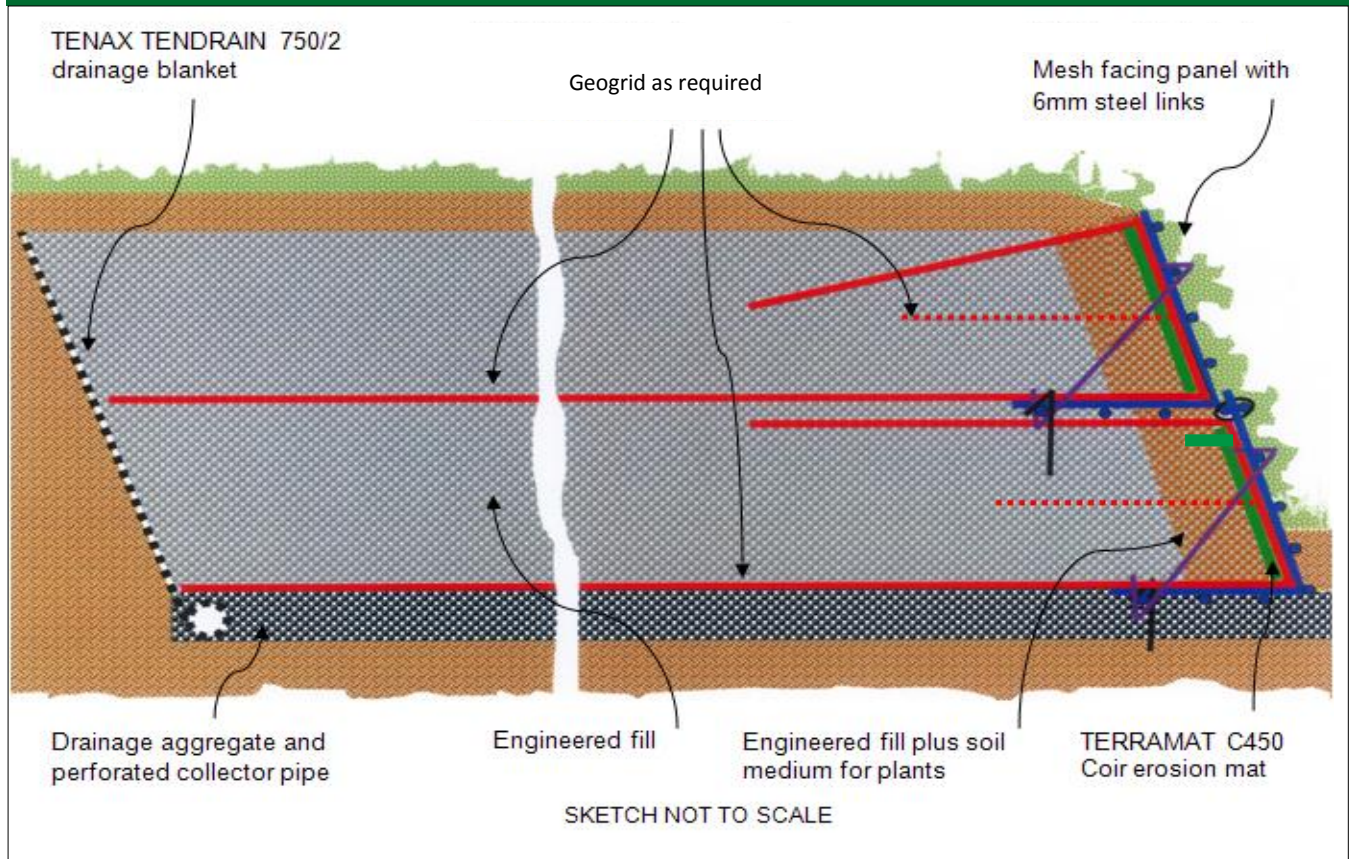
### TYPICAL PANEL MESH OPTIONS

MESH SIZES			
Mesh code	Mesh size	Wire dia.	Mesh sheet size
338	75mm x 75mm	4.0mm	2400 x 1200mm 4560 x 1970mm
333	75mm x 75mm	6.3mm	2400 x 1200mm 4560 x 1970mm
664	150mm x 150mm	6.0mm	2400 x 1200mm 4560 x 1970mm
661	150mm x 150mm	7.5mm	2400 x 1200mm 4560 x 1970mm
Other mesh size / configurations available Typically steel grade is 575 MPa min. tensile strength			

### GENERAL NOTES

- 1) Panels supplied in plain steel or hot dip galvanised after fabrication.
- 2) Panels typically supplied in 2.4 metre lengths but can be supplied in lengths to suit.
- 3) Panels supplied folded to the design face angle / slope.
- 4) Typically the foot of the panel is approx. 2/3<sup>rd</sup> the height of the face lift.
- 5) Panels held true to line during construction with 6mm steel ground pins.
- 6) Panel face held true to line and face angle with 6mm dia. galvanised steel links.
- 7) Adjacent panels are secured to each other at all margins with 'C' rings or gabion tie wire.
- 8) **See installation document for more detail.**

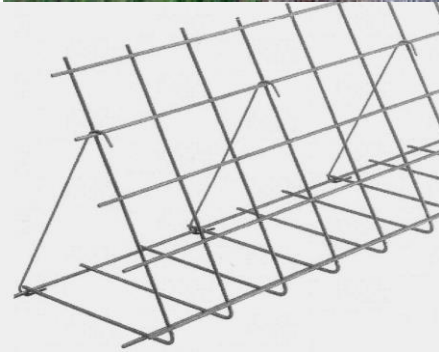
## LIVING EARTH GREEN WALL SYSTEM DIAGRAMMATIC SKETCH OF TYPICAL ARRANGEMENT





## LIVING EARTH GREEN WALL™ INSTALLATION DETAILS

WELDED WIRE MESH FACING SYSTEM COMBINED WITH GEOGRID REINFORCED SOIL WALLS  
 PANEL TO BE USED WITH TENAX 'TT' OR HUESKER 'FORTRAC' GEOGRIDS



PANEL WITH HOOKED LINK RODS



GEOGRID DRAPED OVER PANEL



TERRAMAT BLANKET PLACEMENT



PLACING LINKS THRU TERRAMAT & GEOGRID



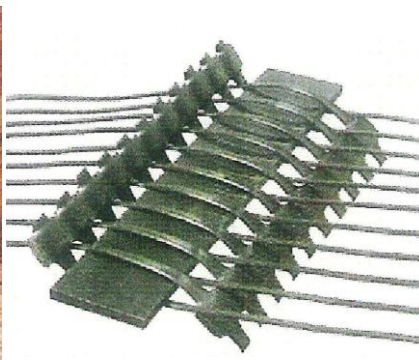
BATTER BOARD / SAFETY RAIL SYSTEM



HAND / PLATE COMPACTING FIRST 1.0m FROM FACE



DO NOT ROLLER COMPACT FIRST 1.0m FROM FACE



BODKIN JOINING TENAX 'TT' GEOGRID



LIVING EARTH GREEN WALL MITRED CORNER



TerraMat C450 coir mat cut to full size of face area, cut ends lapped 100mm min.

6mm hooked link rod linking both face and foot of panel

6mm x 300mm long steel hooked pins

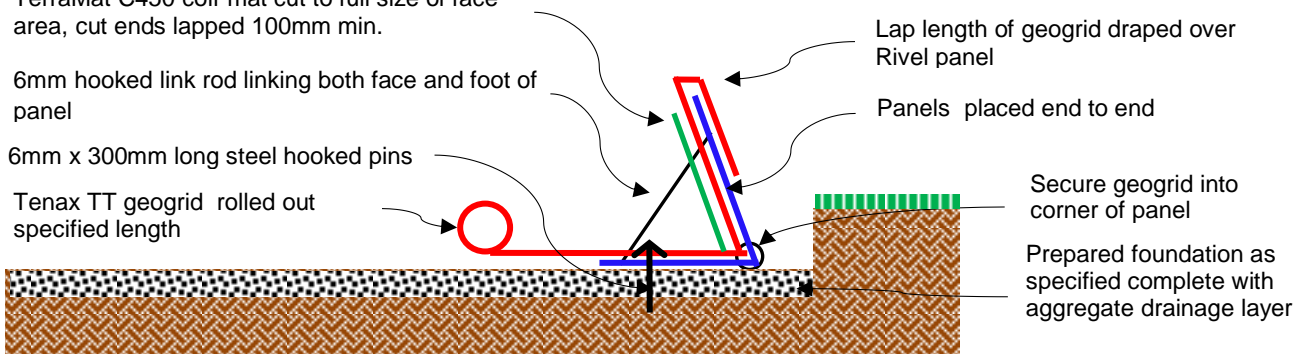
Tenax TT geogrid rolled out specified length

Lap length of geogrid draped over Rivel panel

Panels placed end to end

Secure geogrid into corner of panel

Prepared foundation as specified complete with aggregate drainage layer



- 1) Place panel true to line and level and pin down with two hooked pins equally spaced from ends. To assist in maintaining the line and slope of the wall face use a batter board system, particularly at curved walls
- 2) Hog ring adjoining panel vert. faces together at 150mm centres maximum.
- 3) Roll out geogrid perpendicular to wall face allowing for wall face plus lap length, drape lap length over top of panel.
- 4) Abut or 50mm lap adjoining widths of geogrid. **Gaps between adjoin widths are not accepted.**
- 4) Push geogrid into internal corner of panel and secure with three hog rings or cable ties per metre geogrid width.
- 5) Place TerraMat C450 coir mat and secure as necessary with hog rings thru geogrid to panel.
- 6) At the foot of the panel hook the link rods around the longitudinal bar and at the wall face slit the TerraMat as required to allow access for hooking of the link rod around the longitudinal bar  
Place link rods at  $\frac{1}{4}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$  points across width of the 2.4m long panel, typically links placed at a 45° angle.

### PANEL STEP 'A' : SET-UP OF FIRST LIFT

not to scale

Compacted fill material all as specified

Tenax Tendrain 750/2 drainage blanket at cut face with perforated pipe collector and aggregate drainage layer

Anchor geogrid

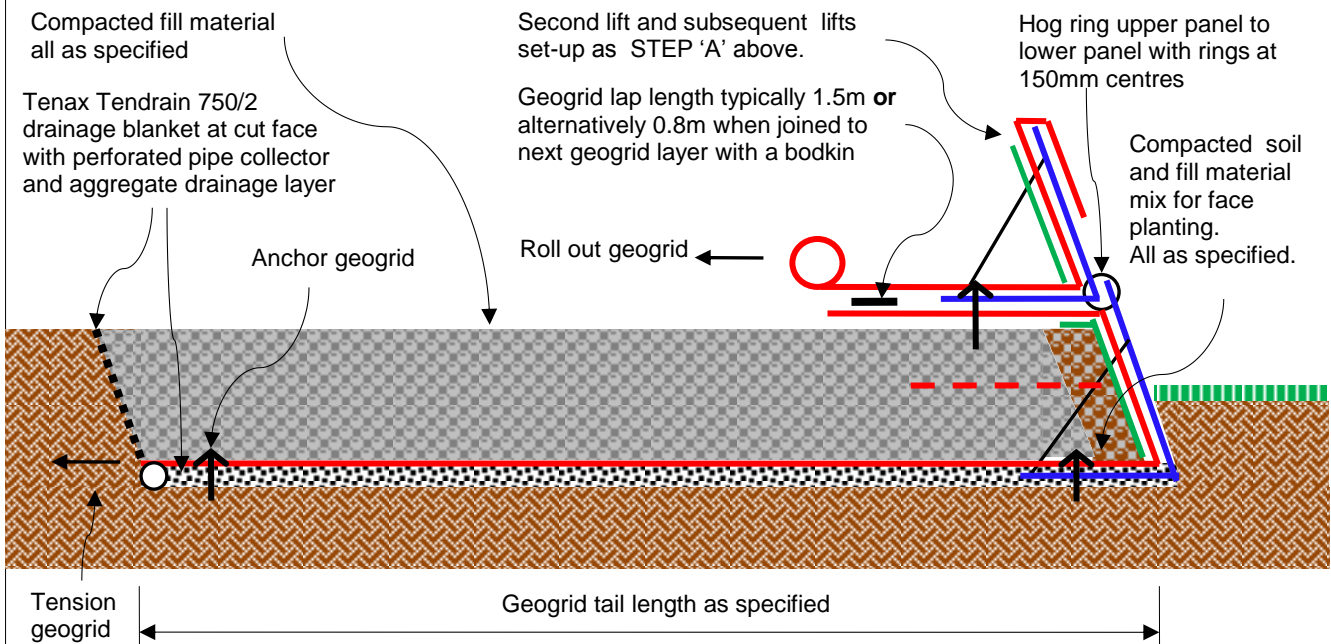
Second lift and subsequent lifts set-up as STEP 'A' above.

Geogrid lap length typically 1.5m or alternatively 0.8m when joined to next geogrid layer with a bodkin

Hog ring upper panel to lower panel with rings at 150mm centres

Compacted soil and fill material mix for face planting. All as specified.

Roll out geogrid



Tension geogrid

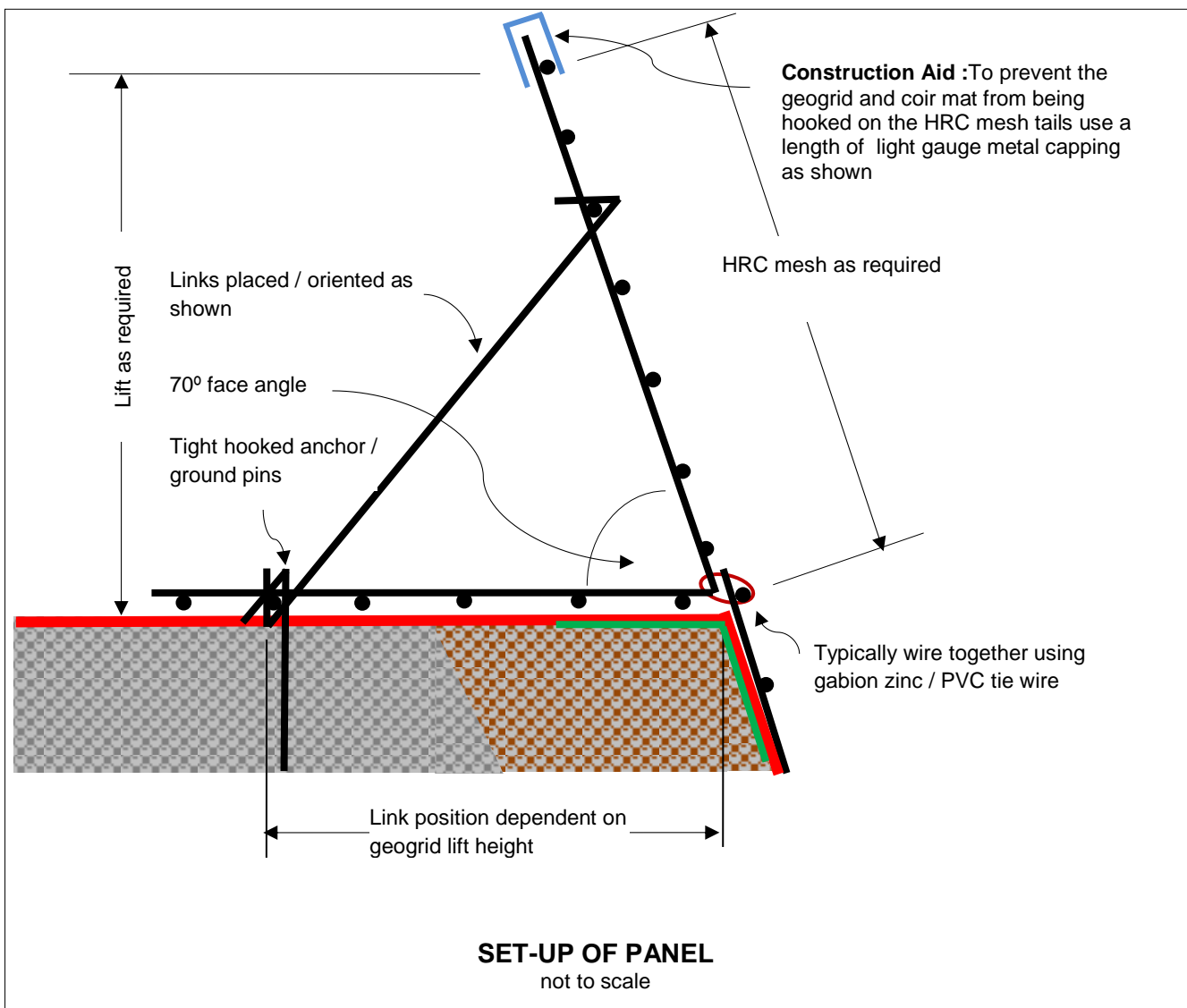
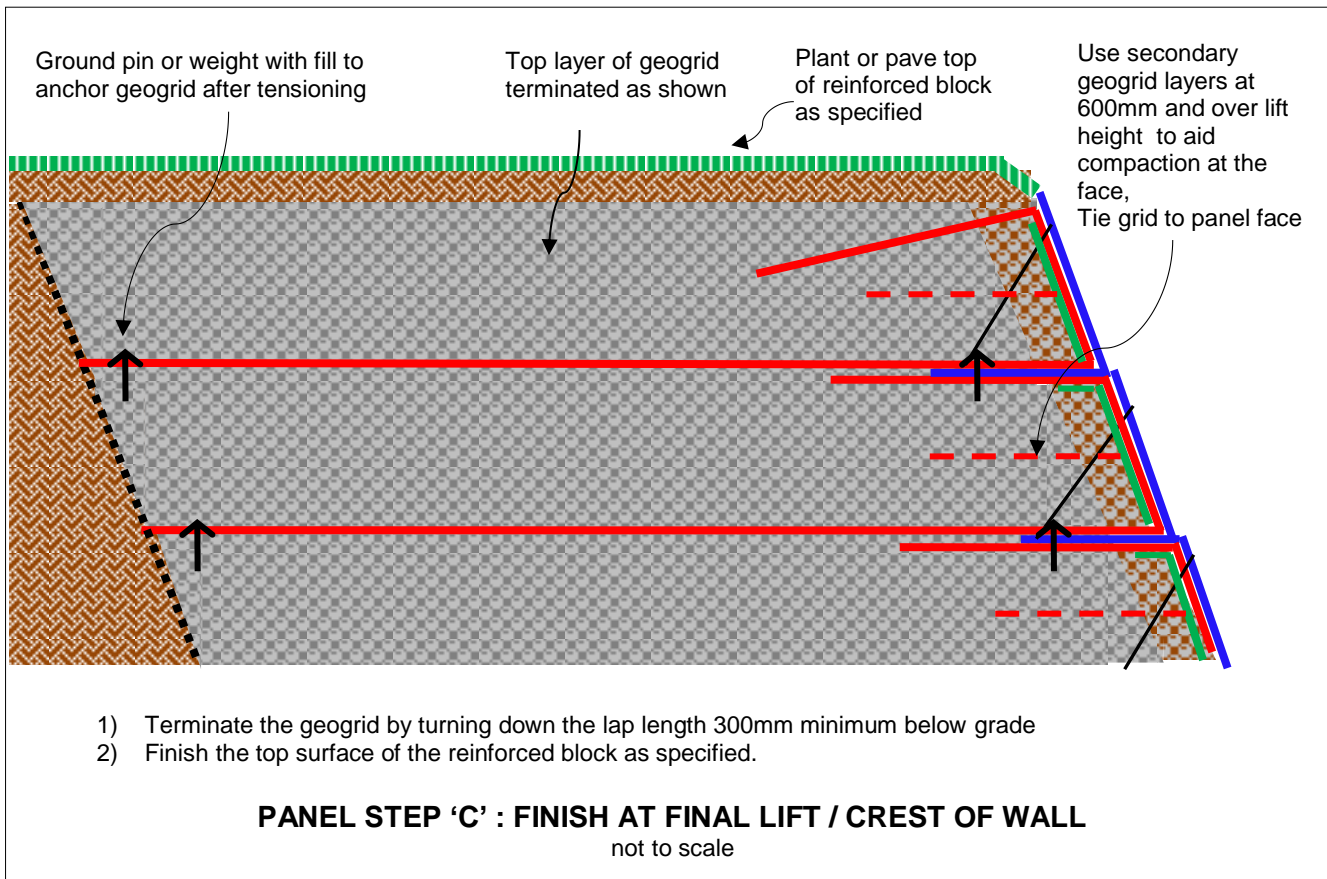
Geogrid tail length as specified

- 1) Roll out the geogrid at **right angles** to the wall face with 0 to 50mm side lap to adjacent geogrid runs.
- 2) Lightly tension the geogrid using a steel garden rake or fork to remove all folds and wrinkles.
- 3) Secure the free end of the geogrid with pins or anchor / weight the end with the specified fill dumped on the geogrid.
- 4) Place and pin the Tenax drainage blanket to the cut face and place the perforated pipe collector with a filter sock wrap.
- 5) Place and compact the MSE fill material maintaining a minimum of 150mm cover to the geogrid.  
**Do not** drive directly over onto the exposed geogrid with wheeled or tracked vehicles.  
**Do not** push the MSE fill material out across the exposed geogrid, cascade the fill material onto and over the exposed geogrid.
- 6) Place and compact the MSE and wall face planting fill material to the required standard and build up in lifts of typically 150 to 200mm thick
- 7) Turn back the geogrid lap length over the compacted fill
- 8) Place the next lift of panel ensuring the geogrid lap length is taught then pin and hog ring the panel as STEP 'A'.
- 9) Hog ring the upper panel to the lower panel at 150mm centres maximum along the wall face.
- 10) Repeat the above steps 'A' and 'B' until the final lift is reached then proceed as step 'C' below.

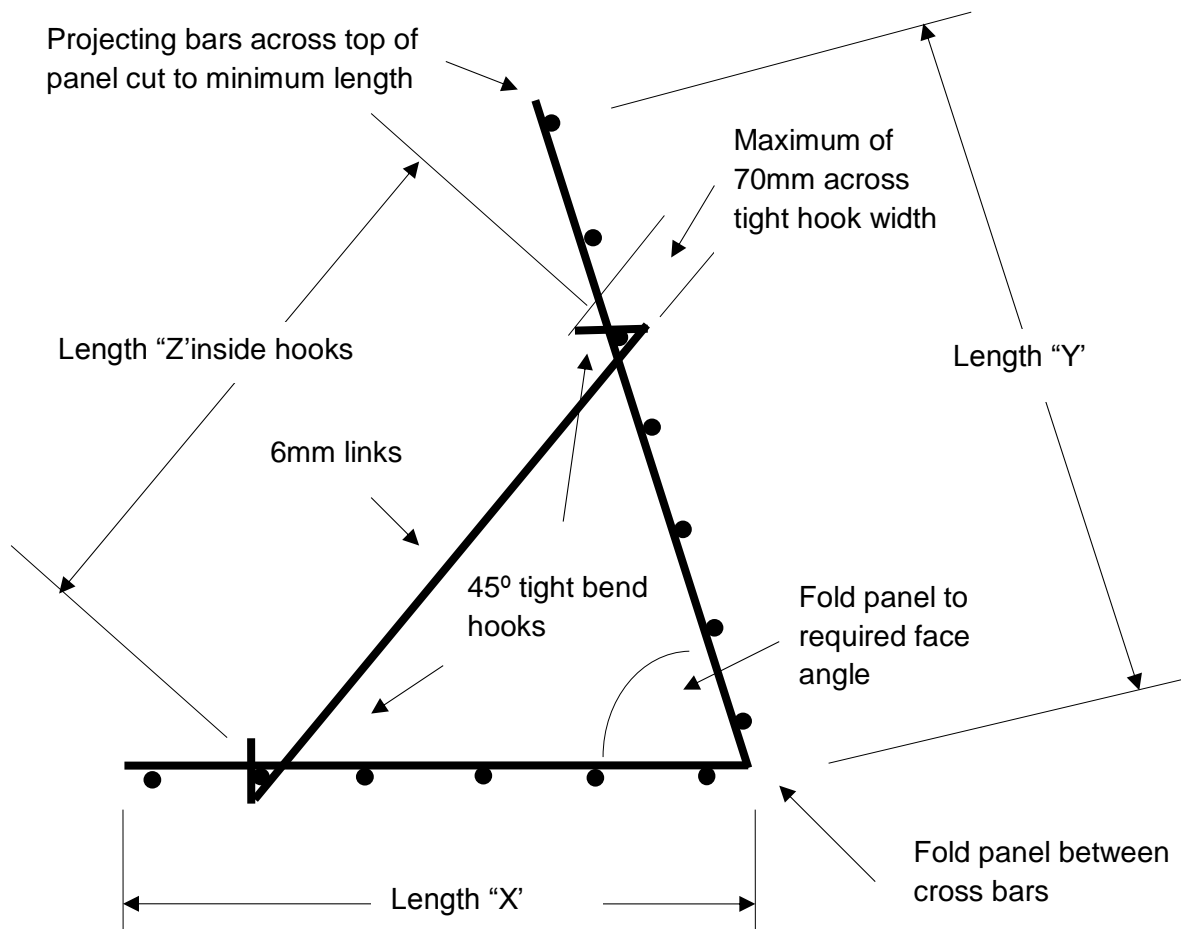
### PANEL STEP 'B' : SET-UP OF SECOND AND SUBSEQUENT LIFTS

not to scale





## PANEL MANUFACTURING DETAILS



### PANEL CROSS SECTION : TYPICAL ARRANGEMENT

Panels typically 2.4 metres long

All components after fabrication to be (A) hot dip galvanised or (B) left as raw steel

Number of panels req.

Mesh size :

Length X :

Face angle :

Length Y :

Number of links req.

Length Z :

Finish galv. or raw

Geotech Systems Order # .....

Project .....

Contractor .....

Delivery Address .....